

**Wyoming Department of Health
Summary of Foodborne and Waterborne Diseases
2003-2008**

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Executive Summary

The Wyoming Department of Health Foodborne and Waterborne Disease Surveillance System is a collaborative effort between personnel in Wyoming Department of Health Infectious Disease Epidemiology Program, local health departments, other state agencies, clinical laboratories, and healthcare providers in Wyoming and elsewhere. These groups work together to identify, investigate, and mitigate the effects of foodborne and waterborne diseases in the State of Wyoming.

Data presented in this report were collected by the Wyoming Department of Health Infectious Disease Epidemiology Program through the Reportable Diseases and Conditions surveillance system and through public health case follow-up. The Foodborne and Waterborne Disease Surveillance database contains information on certain reportable foodborne and waterborne diseases and the public health investigations carried out on these disease occurrences. This database contains information regarding the etiology, patient demographics, geographic location, clinical laboratory results, exposure histories, and public health control measures for each reported occurrence. Data were analyzed by state-level epidemiologists and other staff, and additional retrospective case review was performed to verify actual case counts.

This report provides an overview of descriptive epidemiology of certain reportable foodborne and waterborne diseases and conditions. Because retrospective case review was conducted to verify case counts, some data provided in this report may differ from case counts reported in other Wyoming Department of Health reports such as the published year-end summaries. This report provides the best estimates of the historical occurrence of foodborne and waterborne diseases in Wyoming for the years 2003-2008 and aims to provide descriptive information regarding the populations at risk, common risk factors, and outbreaks of each disease.

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Methods

Definitions

- Crude incidence rate - Incidence is defined as the number of *new* cases diagnosed during a set time period in a defined population. Incidence is not a representation of risk. Therefore, a crude incidence rate is the number of new cases of a disease within the specified population. A crude incidence rate has not been adjusted for age or other confounding variables. All crude incidence rates in this document are reported as the number of cases per 100,000 population.
- Age-adjusted incidence rate – Statewide age-adjusted rates reported in this document were standardized against the 2000 U.S population using specified age groups and are reported as the number of cases per 100,000 population. County age-adjusted rates reported in this document were standardized against the median population in Wyoming from 2003-2007 (2008 census data was not available at the time of this report) for the specific age group and are also reported as the number of cases per 100,000 population. Age-adjustment allows rates to be compared over time and allows rates from one geographic area (i.e., county) to be compared with rates from another geographic area that may have differences in age distributions. Any observed differences in age-adjusted incidence rates are not due to differing age structures.
- Age-specific incidence rate - An age-specific rate is the rate of disease found within a certain age group. Age-specific incidence rates were calculated using specified age groups and total population (both sexes combined). They are reported per 100,000 population.
- Standardized incidence ratio –The standardized incidence ratio (SIR) is a summary ratio that allows a comparison of incidence rates from a defined population to a standard population. When comparing statewide incidence rates, the 2000 US standard population was used to calculate the SIR. When comparing county incidence rates, the Wyoming standard population (median population from 2003-2007, as 2008 census data was not available) was used to calculate the SIR. It was not possible to calculate the state-level SIR for those diseases that are not nationally reportable due to lack of national summary data. A ratio of 1.00 indicates that the observed number of cases equals the expected number of cases. A ratio above 1.00 indicates that there were more cases observed than expected. Thus, a ratio of 1.25 means that there were 25 percent more observed cases than expected. A ratio below 1.00 indicates that there were fewer observed cases than expected. Therefore, a ratio of 0.85 is interpreted as 15 percent fewer observed cases occurring than expected. The confidence interval of a standardized incidence ratio is interpreted as follows:
 - If the lower number in the confidence interval is less than or equal to 1.00 and the upper number in the interval is greater than or equal to 1.00, there is no statistically significant difference between the number of observed cases and the number of expected cases.
 - If the lower number in the confidence interval is above 1.00, there is a 95 percent probability that a significantly higher number of cases were observed than expected.
 - If the upper number in the confidence interval is less than 1.00, there is a 95 percent probability that significantly fewer cases were observed than expected.

Amoebiasis (*Entamoeba histolytica*)

Case definition

- Confirmed
 - Intestinal amoebiasis:
 - Demonstration of *E. histolytica* cysts or trophozoites in stool, OR
 - Demonstration of trophozoites of *E. histolytica* in tissue biopsy or ulcer scrapings by histopathology or culture
 - Extraintestinal amoebiasis:
 - Demonstration of trophozoites of *E. histolytica* in extraintestinal tissue, OR
 - Presence of specific antibody against *E. histolytica* as measured by indirect hemagglutination (IHA) or other reliable immunodiagnostic test such as enzyme linked immunosorbent assay (ELISA), in a symptomatic person with clinical and/or radiological findings consistent with extraintestinal infection. A positive serologic test in an asymptomatic person does not necessarily indicate extraintestinal amoebiasis
- Probable[†]
 - Patient with epidemiologic link to a confirmed case and clinically compatible illness

[†]The US Centers for Disease Control and Prevention (CDC) does not define or utilize a definition for “probable” case status. The probable case definition is used by the Wyoming Department of Health solely for surveillance purposes.

Summary

From 2003-2008, six cases of amoebiasis were reported to the WDH Infectious Disease Epidemiology Program (0.20 cases per 100,000 per year). Of those, five were confirmed and one was probable. Wyoming’s incidence rate for amoebiasis was statistically less than the US incidence rate (0.66 cases per 100,000 per year) (SIR: 0.22, 95%CI: 0.04-0.39). Based on historical statewide incidence, zero cases of amoebiasis are expected annually in Wyoming. Therefore, the occurrence of a single case represents a statistically significant increase over baseline. Cases were reported in only two years during time period of interest, in 2004 and 2008. Among these cases, the median age of cases of amoebiasis was 18 years (range: 0-38 years). Persons aged 0-4 years had the highest crude, age-specific incidence rate (0.99 cases per 100,000 per year). However, the ages of two cases (33.3%) were not collected/reported in the database. Four cases (66.7%) were male. Public health officials were not able to identify a likely source for any of the cases. In 2004, both cases were sporadic and did not report common exposures. In 2008, all four cases were associated with one household cluster in Uinta County, and all four reported history of out-of-state travel during their exposure periods. In 2008, one child case was diagnosed with amoebic liver abscesses and was subsequently hospitalized. Counties reporting cases of amoebiasis in 2003-2008 include Sweetwater, Uinta, and Washakie Counties.

Table 1: Occurrence of Amoebiasis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	0	2	0	0	0	3	5
Probable	0	0	0	0	0	1	1
Total	0	2	0	0	0	4	6

Figure 1: Incidence of Amoebiasis by Year Reported, Wyoming, 2003-2008

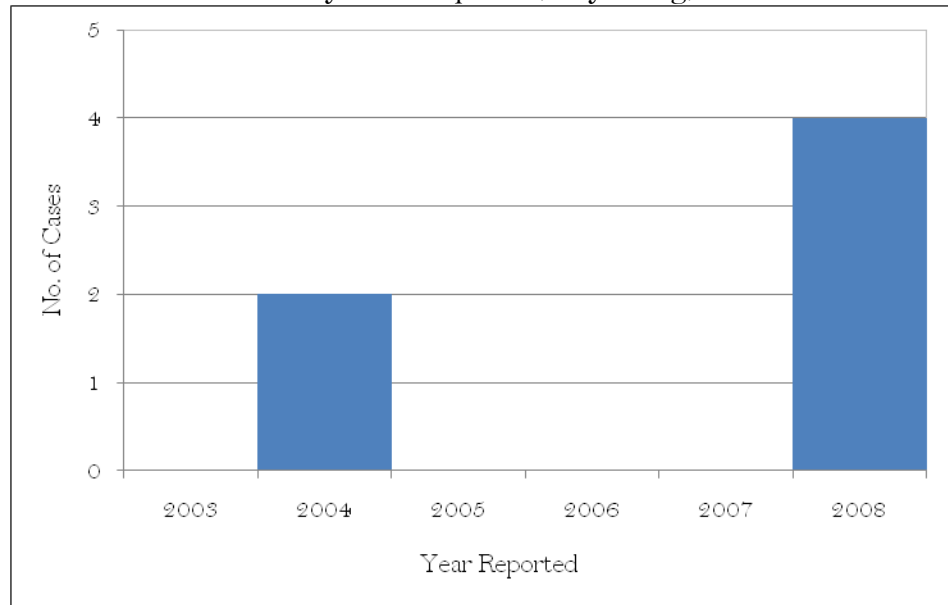


Figure 2: Incidence of Amoebiasis by Month, Wyoming, 2003-2008

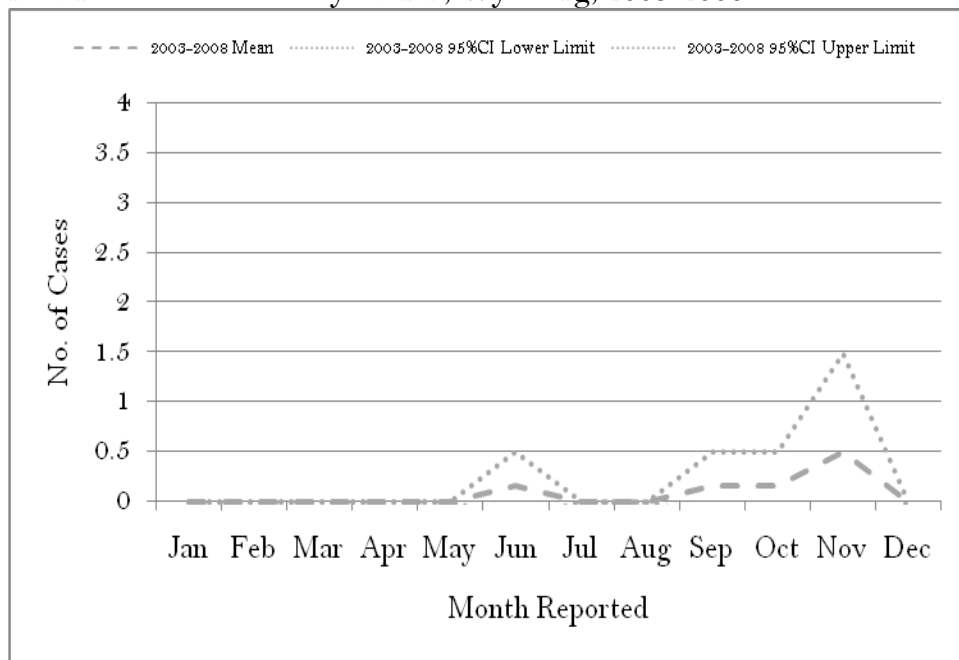
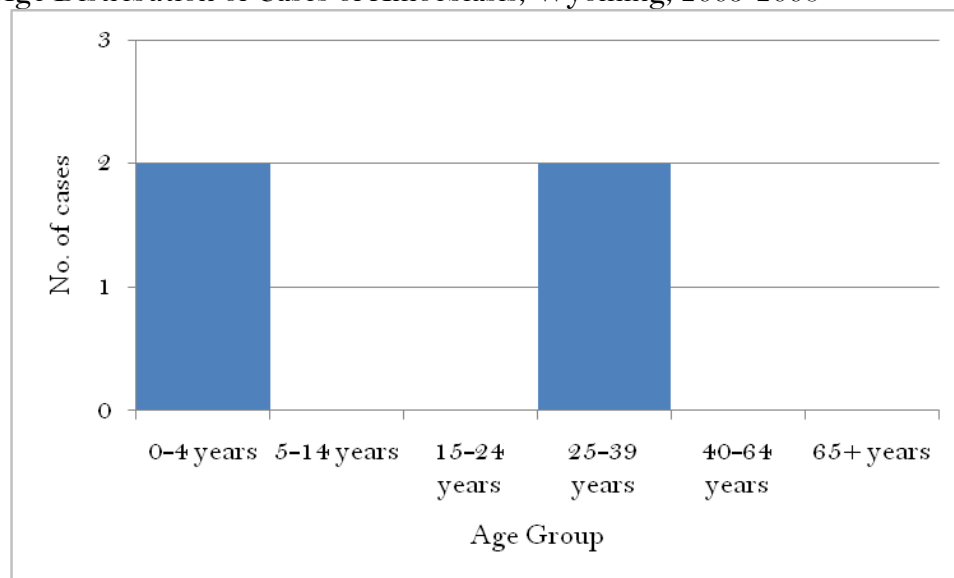


Table 2: Demographics of Case Patients with Amoebiasis (N=6), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	0	1	0	0	0	1	2 (33.3%)
5-14 years	0	0	0	0	0	0	0 (0.0%)
15-24 years	0	0	0	0	0	0	0 (0.0%)
25-39 years	0	1	0	0	0	1	2 (33.3%)
40-64 years	0	0	0	0	0	0	0 (0.0%)
≥65 years	0	0	0	0	0	0	0 (0.0%)
Unknown	0	0	0	0	0	2	2 (33.3%)
Gender							
Female	0	0	0	0	0	2	2 (33.3%)
Male	0	2	0	0	0	2	4 (66.7%)
Hospitalized							
Yes	0	0	0	0	0	1	1 (16.7%)
No	0	0	0	0	0	3	3 (50.0%)
Unknown	0	2	0	0	0	0	2 (33.3%)
Outbreak status							
Cluster Related	0	0	0	0	0	4	4 (66.7%)
Outbreak related	0	0	0	0	0	0	0 (0.0%)

Figure 3: Age Distribution of Cases of Amoebiasis, Wyoming, 2003-2008



*Two cases in 2008 had unknown age.

Table 3: Incidence of Amoebiasis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	0	0.0	0.0	—
Big Horn	0	0.0	0.0	—
Campbell	0	0.0	0.0	—
Carbon	0	0.0	0.0	—
Converse	0	0.0	0.0	—
Crook	0	0.0	0.0	—
Fremont	0	0.0	0.0	—
Goshen	0	0.0	0.0	—
Hot Springs	0	0.0	0.0	—
Johnson	0	0.0	0.0	—
Laramie	0	0.0	0.0	—
Lincoln	0	0.0	0.0	—
Natrona	0	0.0	0.0	—
Niobrara	0	0.0	0.0	—
Park	0	0.0	0.0	—
Platte	0	0.0	0.0	—
Sheridan	0	0.0	0.0	—
Sublette	0	0.0	0.0	—
Sweetwater	1	0.44	0.46	2.35 (-2.25-6.94)
Teton	0	0.0	0.0	—
Uinta	4	3.40	3.20	8.34 (0.17-16.52)
Washakie	1	2.15	2.51	12.76 (-12.25-37.78)
Weston	0	0.0	0.0	—
Total	6	0.20	0.14	0.22 (0.04-0.39)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

†SIR calculated using estimated national incidence rate of 0.66 cases per 100,000 per year.

§ Estimate is statistically significant at the 95% confidence level

Table 4: Reported Characteristics and Exposures among Cases of Amoebiasis (N=6), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Ate at any restaurant	—	0	—	—	—	1	1 (16.7%)
Attended daycare	—	0	—	—	—	0	0 (0.0%)
Worked at a daycare	—	0	—	—	—	0	0 (0.0%)
Live with a daycare attendee	—	0	—	—	—	0	0 (0.0%)
Traveled out of state during exposure period	—	0	—	—	—	4	4 (66.7%)
Worked as a foodhandler while ill	—	0	—	—	—	0	0 (0.0%)
Worked as a healthcare worker while ill	—	0	—	—	—	0	0 (0.0%)

Outbreaks of Amoebiasis, Wyoming, 2003-2008

Household Cluster of Amoebiasis, Uinta County, 2008

In November 2008, Uinta County Public Health notified the WDH Infectious Disease Epidemiology Program of two confirmed cases and one probable case of amoebiasis in one Uinta County family. The index case was an infant who had tested positive for the parasite at a Utah hospital. The infant underwent surgery to remove parasite-related liver and lung abscesses. The attending pediatrician identified that two other children in the household were symptomatic with an illness consistent with amoebiasis and both of those children were subsequently tested. One sibling was positive for *E. histolytica* and the other was negative. The WDH Infectious Disease Epidemiology Program and Uinta County Public Health conducted follow-up with the family. Although the parents denied symptoms, both were tested in accordance with public health guidelines. *E. histolytica* was subsequently identified in the mother's stool sample as well. In total, four out of six of the family members were considered cases. A source of the infection was not identified.

Botulism (*Clostridium botulinum*)

Case definition

- Foodborne
 - Confirmed - a clinically compatible case that is laboratory confirmed or that occurs among persons who ate the same food as persons who have laboratory-confirmed botulism. Lab-confirmation must include at least one of the following criteria:
 - Detection of botulinum toxin in serum, stool, or patient's food, or
 - Isolation of *Clostridium botulinum* from stool
 - Probable - a clinically compatible case with an epidemiologic link (e.g., ingestion of a home-canned food within the previous 48 hours)
- Infant
 - Confirmed - a clinically compatible case that is laboratory-confirmed, occurring in a child aged less than 1 year. Lab-confirmation must include at least one of the following criteria:
 - Detection of botulinum toxin in stool or serum, or
 - Isolation of *Clostridium botulinum* from stool
- Wound
 - Confirmed - a clinically compatible case that is laboratory confirmed in a patient who has no suspected exposure to contaminated food and who has a history of a fresh, contaminated wound during the 2 weeks before onset of symptoms. Lab-confirmation must include at least one of the following criteria:
 - Detection of botulinum toxin in serum, or
 - Isolation of *Clostridium botulinum* from wound
- Other
 - Confirmed – a clinically compatible case that is laboratory confirmed in a patient aged greater than or equal to 1 year who has no history of ingestion of suspect food and has no wounds. Lab-confirmation must include at least one of the following criteria:
 - Detection of botulinum toxin in clinical specimen, or
 - Isolation of *Clostridium botulinum* from clinical specimen

Summary

From 2003-2008, two cases of botulism were reported to the WDH Infectious Disease Epidemiology Program (0.07 cases per 100,000 per year). Of those, one was foodborne and one was infant botulism. The incidence of botulism in Wyoming was equivalent to the US national incidence, which is 0.0 cases per 100,000 per year (SIR: incalculable). Annually, zero cases of botulism are expected in Wyoming. Therefore, the occurrence of a single case represents a statistically-significant increase over baseline. Cases were reported in only two years during time period of interest, in 2006 and 2008. The age of the one infant botulism case was five months, and the age of the foodborne botulism case was five years. Persons aged 0-4 years had the highest crude, age-specific incidence rate (0.14 cases per 100,000 per year). The infant botulism case was male and the foodborne botulism case was female. Public health officials were not able to identify a definitive source for either case. Counties reporting cases of botulism in 2003-2008 include Laramie and Natrona Counties. Age-adjusted incidence rates of Laramie (0.20 cases per 100,000) and Natrona (0.24 cases per 100,000) were not statistically different than the expected rate.

Table 5: Incidence of Botulism by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Foodborne							
Confirmed	0	0	0	0	0	0	0
Probable	0	0	0	1	0	0	1
Infant							
Confirmed	0	0	0	0	0	1	1
Wound							
Confirmed	0	0	0	0	0	0	0
Other							
Confirmed	0	0	0	0	0	0	0
Total	0	0	0	1	0	1	2

Figure 4: Incidence of Botulism (all types) by Year Reported, Wyoming, 2003-2008



Table 6: Demographics of Case Patients with Botulism (all types, N=2), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	0	0	0	0	0	1	1 (50.0%)
5-14 years	0	0	0	1	0	0	1 (50.0%)
15-24 years	0	0	0	0	0	0	0 (0.0%)
25-39 years	0	0	0	0	0	0	0 (0.0%)
40-64 years	0	0	0	0	0	0	0 (0.0%)
≥65 years	0	0	0	0	0	0	0 (0.0%)
Unknown	0	0	0	0	0	0	0 (0.0%)
Gender							
Female	0	0	0	1	0	0	1 (50.0%)
Male	0	0	0	0	0	1	1 (50.0%)

Hospitalized							
Yes	0	0	0	1	0	1	2 (100.0%)
No	0	0	0	0	0	0	0 (0.0%)
Unknown	0	0	0	0	0	0	0 (0.0%)
Outbreak status							
Cluster Related	0	0	0	0	0	0	0 (0.0%)
Outbreak related	0	0	0	0	0	0	0 (0.0%)

Figure 5: Age Distribution of Cases of Botulism, Wyoming, 2003-2008

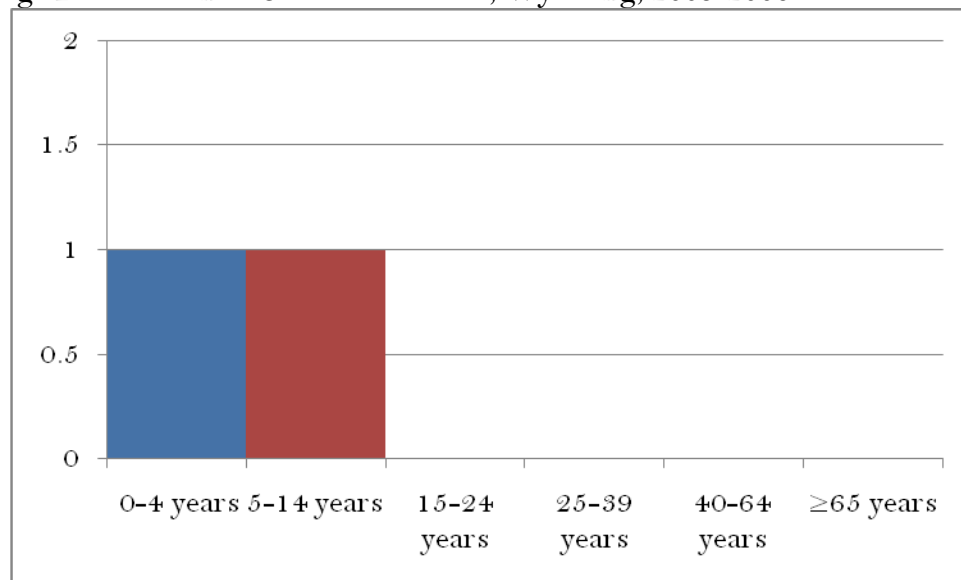


Table 7: Incidence of Botulism by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	0	0.0	0.0	—
Big Horn	0	0.0	0.0	—
Campbell	0	0.0	0.0	—
Carbon	0	0.0	0.0	—
Converse	0	0.0	0.0	—
Crook	0	0.0	0.0	—
Fremont	0	0.0	0.0	—
Goshen	0	0.0	0.0	—
Hot Springs	0	0.0	0.0	—
Johnson	0	0.0	0.0	—

Laramie	1	0.20	0.19	2.67 (-2.56-7.90)
Lincoln	0	0.0	0.0	—
Natrona	1	0.24	0.23	3.32 (-3.19-9.82)
Niobrara	0	0.0	0.0	—
Park	0	0.0	0.0	—
Platte	0	0.0	0.0	—
Sheridan	0	0.0	0.0	—
Sublette	0	0.0	0.0	—
Sweetwater	0	0.0	0.0	—
Teton	0	0.0	0.0	—
Uinta	0	0.0	0.0	—
Washakie	0	0.0	0.0	—
Weston	0	0.0	0.0	—
Total	2	0.07	0.07	—

**Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.*

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Campylobacteriosis

Case definition

- Confirmed – a case that is laboratory confirmed by isolation of *Campylobacter* bacteria from any clinical specimen
- Probable – a clinically compatible case that is epidemiologically-linked to a laboratory-confirmed case

**This condition is not nationally notifiable.*

Summary

From 2003-2008, 358 cases of campylobacteriosis were reported to the WDH Infectious Disease Epidemiology Program (11.73 cases per 100,000 per year). Of the cases reported, 320 (89.4%) were laboratory-confirmed and 38 (10.6%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of campylobacteriosis in Wyoming was statistically equivalent to the estimated US incidence (12.7 cases per 100,000 per year) based on CDC FoodNet sites (SIR: 0.91, 95%CI: 0.82-1.00). The median age of cases of campylobacteriosis was 29 years (range: 0-86 years). Persons aged 40-64 years had the highest age-specific incidence rate (9.94 cases per 100,000 per year). Cases were more likely to be male (58.9%) than female (41.1%). While a definitive source of the infection could not be determined in nearly 40% of all cases, contact with animals, especially cattle, and consumption of unpasteurized milk or unpasteurized milk products continue to be frequent sources of *Campylobacter* infection in Wyoming.

All Wyoming counties reported at least one case of campylobacteriosis in 2003-2008. Goshen County reported the highest age-adjusted incidence rate (35.95 cases per 100,000 per year), which was three times greater than the expected statewide incidence rate (11.73 cases per 100,000 per year). In addition to Goshen County, Weston County (33.16 cases per 100,000 per year), Lincoln County (27.94 cases per 100,000 per year), Park County (25.41 cases per 100,000 per year), and Teton County (23.87 cases per 100,000 per year) had incidence rates that were statistically greater than the statewide incidence rate. Laramie County (1.99 cases per 100,000 per year), Carbon County (2.00 cases per 100,000 per year), and Sweetwater County (3.21 cases per 100,000 per year) had incidence rates that were statistically less than the statewide incidence rate. All other counties had age-adjusted incidence rates that were statistically equivalent to the statewide incidence rate.

Table 8: Occurrence of Campylobacteriosis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	49	60	58	47	63	43	320
Probable	1	1	12	4	8	12	38
Total	50	61	70	51	71	55	358

Figure 6: Occurrence of Campylobacteriosis by Year Reported, Wyoming, 2003-2008

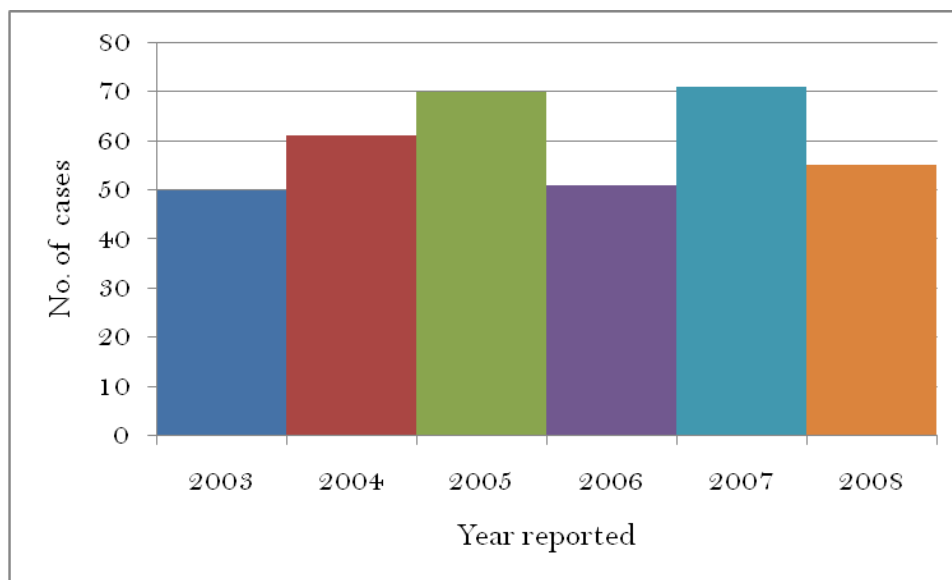


Figure 7: Incidence of Campylobacteriosis by Month Reported, Wyoming, 2003-2008

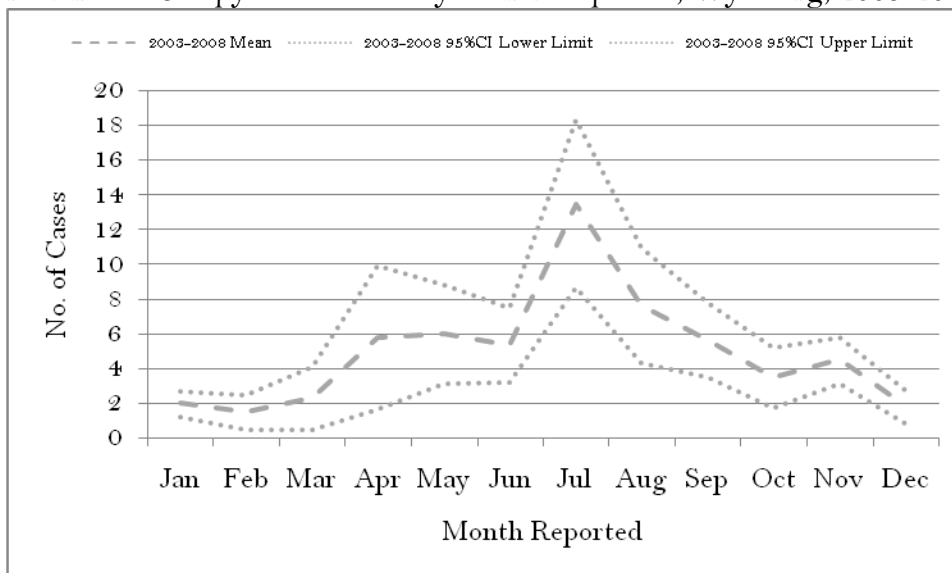
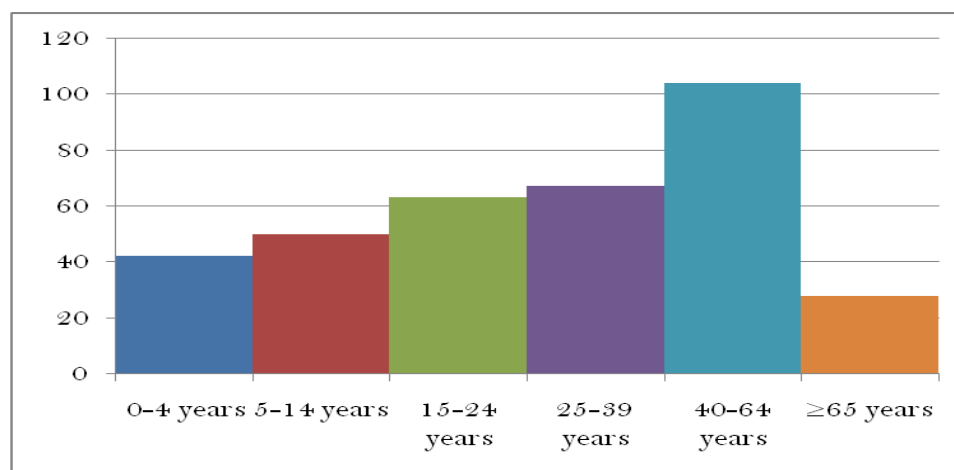


Table 9: Demographics of Case Patients with Campylobacteriosis (N=358), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							N=358
0-4 years	5	8	12	2	6	8	42 (11.7%)
5-14 years	6	11	10	10	5	8	50 (14.0%)
15-24 years	10	9	10	9	20	5	63 (17.6%)
25-39 years	11	9	14	12	14	7	67 (18.7%)
40-64 years	14	18	18	13	22	19	104 (29.1%)
≥65 years	4	6	4	4	4	6	28 (7.8%)
Unknown	0	0	2	0	0	2	4 (1.1%)
Median age	32 yrs	29 yrs	26 yrs	28 yrs	31 yrs	31 yrs	29 yrs
Age range:	0-83 yrs	0-75 yrs	0-83 yrs	1-71 yrs	0-86 yrs	0-79 yrs	0-86 yrs
Gender							
Female	16	26	29	18	34	24	147 (41.1%)
Male	34	35	41	33	37	31	211 (58.9%)
Hospitalized							
Yes	10	17	13	6	14	10	70 (19.6%)
No	38	41	55	43	52	42	271 (75.7%)
Unknown	2	3	2	2	5	3	17 (4.7%)
Median no. of days hospitalized	2 days	2 days	2 days	1.5 days	2.5 days	2 days	2 days
Range of no. of days hospitalized	1-11 days	1-3 days	1-7 days	1-11 days	1-10 days	1-4 days	1-11 days
Outbreak status							
Outbreak/ cluster related	0	9	17	10	10	5	51 (14.2%)

Figure 8: Age Distribution of Cases of Campylobacteriosis (N=358), Wyoming, 2003-2008



*Age was unknown for 4 cases

Table 10: Crude and Age-adjusted Incidence of Campylobacteriosis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	16	8.20	6.83	0.58 (0.30-0.87)§
Big Horn	12	17.93	18.60	1.59 (0.69-2.48)
Campbell	23	10.20	11.07	0.94 (0.56-1.33)
Carbon	2	2.22	2.00	0.17 (-0.07-0.41)§
Converse	11	14.70	15.55	1.33 (0.54-2.11)
Crook	5	13.77	14.98	1.28 (0.16-2.40)
Fremont	21	9.57	9.17	0.78 (0.45-1.12)
Goshen	26	35.89	35.95	3.06 (1.89-4.24)§
Hot Springs	2	7.33	10.12	0.86 (-0.33-2.06)
Johnson	10	21.73	24.56	2.09 (0.80-3.39)
Laramie	10	1.96	1.99	0.17 (0.06-0.27)§
Lincoln	25	27.42	27.94	2.38 (1.45-3.32)§
Natrona	40	9.69	9.63	0.82 (0.57-1.08)
Niobrara	3	22.40	20.45	1.74 (-0.23-3.72)
Park	39	24.59	25.41	2.17 (1.49-2.85)§
Platte	12	23.53	26.31	2.24 (0.97-3.51)
Sheridan	26	15.87	16.03	1.37 (0.84-1.89)
Sublette	6	14.35	13.99	1.19 (0.24-2.15)
Sweetwater	7	3.10	3.21	0.27 (0.07-0.48)§
Teton	29	24.89	23.87	2.03 (1.29-2.77)§
Uinta	18	15.28	13.00	1.11 (0.60-1.62)
Washakie	3	6.44	7.01	0.60 (-0.08-1.27)
Weston	12	30.30	33.16	2.83 (1.23-4.43)§
Total	358	11.73	12.70	0.91 (0.82-1.00)†

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 12.70 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 11: Clinical Characteristics among Cases of Campylobacteriosis, Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	42	56	67	42	65	51	323 (90.2%)
No	1	0	0	0	0	0	1 (0.3%)
Unknown	7	5	3	9	6	4	34 (9.5%)
Specimen source							
Stool	47	61	58	47	63	42	318 (88.8%)
Blood	2	0	0	0	0	1	3 (0.8%)
Unspecified	1	12	3	9	8	12	37 (10.3%)
Bacterial isolate was confirmed at WPHL*							
Yes	18	38	40	31	44	25	196 (54.7%)

No	32	23	30	20	27	30	162 (45.2%)
Species of <i>Campylobacter</i> (N=211)							
<i>C. jejuni</i>	21	36	40	31	40	26	193 (91.5%)
<i>C. coli</i>	1	2	4	0	4	2	12 (5.7%)
<i>C. upsaliensis</i>	0	0	0	1	4	0	5 (2.4%)
Untypeable	0	0	0	0	1	0	1 (0.5%)
Received antibiotic							
Yes	22	25	35	22	41	28	173 (48.3%)
No	6	12	10	14	10	19	71 (19.8%)
Unknown	22	24	25	15	20	8	114 (31.8%)

* *Wyoming state statute requires clinical laboratories to send confirmed *Campylobacter* isolates to the Wyoming Public Health Laboratory for confirmation, subtyping and pulsed-field gel electrophoresis analysis.*

Table 12: Most Likely Source of Infection among Cases of Campylobacteriosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Source not evident	27	23	23	20	30	17	140 (39.1%)
Animal source	14	24	23	15	30	25	131 (36.6%)
Unpasteurized milk/milk-products	3	5	14	2	1	0	25 (7.0%)
Foreign travel	3	5	2	3	6	3	22 (6.2%)
Drinking water	1	0	2	11	2	1	17 (4.8%)
Food source at home	0	1	1	0	2	6	10 (2.8%)
Recreational water	1	0	5	0	0	1	7 (2.0%)
Multiple exposures	1	1	0	0	0	1	3 (0.84%)
Food source at restaurant or other food venue	0	1	0	0	0	1	2 (0.56%)
Person-to-person transmission	0	1	0	0	0	0	1 (0.28%)

Likely exposures are determined by making a "best guess" by trained epidemiologists based on the case patient's exposure history and should not be viewed as a definitive source of infection.

Table 13: Frequency of Certain Animal Exposures Reported by Cases of Campylobacteriosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Contact with dog	14	16	23	17	24	29	123 (34.4%)
Contact with cattle	13	17	23	13	24	14	104 (29.1%)
Contact with cat	11	8	11	10	14	7	61 (17.0%)
Contact with horse	4	5	12	4	6	5	36 (10.0%)
Contact with bird	4	6	7	3	5	5	30 (8.4%)
Contact with sheep	3	6	4	2	3	2	20 (5.6%)
Contact with pig	2	0	2	2	1	6	13 (3.6%)
Contact with goat	2	1	3	0	2	1	9 (2.5%)
Contact with rodent	2	2	1	1	1	2	9 (2.5%)
Contact with reptile	1	1	0	0	0	0	2 (0.5%)
Contact with amphibian	0	1	0	1	0	0	2 (0.5%)

Percentages can add up to more than 100% because case patients can report exposure to more than one of these types of animals.

Table 14: Frequency of Other Exposures among Cases of Campylobacteriosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Ate at any restaurant	25	16	27	29	47	34	178 (49.7%)
Ate at any fast food restaurant	7	8	11	11	18	19	74 (20.7%)
Consumed water from a private well	11	13	30	19	23	10	106 (29.6%)
Swam in treated water venue	3	1	3	3	7	8	25 (7.0%)
Swam in untreated water venue	6	5	8	7	10	6	42 (11.7%)
Attended daycare	0	1	3	2	2	0	8 (2.2%)
Live with daycare attendee	0	1	2	1	1	0	5 (1.4%)
Out of state travel	14	7	10	9	16	15	71 (19.8%)
International travel	6	5	2	4	8	5	30 (8.4%)

Percentages can add up to more than 100% because case patients can report more than one of these exposures.

Table 15: Frequency of Reported High-Risk Occupations among Cases of Campylobacteriosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Food-handling employee	0	2	4	2	1	2	11 (3.1%)
Healthcare worker with direct patient contact	1	0	2	2	0	0	5 (1.4%)
Daycare worker	0	0	0	0	0	0	0 (0.0%)

Public health guidelines call for the exclusion of these individuals from their high-risk occupational setting until 48 hours has passed since the last bout of diarrhea or vomiting, whichever occurs last.

Outbreaks of Campylobacteriosis, 2003-2008

Outbreak of *Campylobacter jejuni* Associated with Peepering Pheasants at Pheasant Farm, Sheridan County, 2004

In June 2004, the WDH Infectious Disease Epidemiology Program received a report of a Sheridan County resident with laboratory-confirmed *Campylobacter* infection. Follow-up revealed that this patient had been peepering pheasants at a local pheasant farm prior to illness onset. In July 2004, a second case of campylobacteriosis was identified in another worker at the pheasant farm. Both patients had laboratory-confirmed infections with *Campylobacter coli*, and *Campylobacter* isolates from both patients revealed that the bacterial infections were genetically identical through pulsed-field gel electrophoresis (PFGE). Accidental ingestion of the bacteria after bare-hand contact with the birds is suspected as the source of the patients' infections.

(Heryford, et al. *Outbreak of Occupational Campylobacteriosis Associated with a Pheasant Farm*. J Agric Saf Health 2004; 10(2):127-132).

Outbreak of *Campylobacter coli* Associated with Raw Milk Consumption, Park County, 2004

In July 2004, the WDH Infectious Disease Epidemiology Program received reports of three laboratory-confirmed cases of campylobacteriosis in a family from Park County. A fourth member of the household was also ill, but was not tested and was considered a probable case. All four ill family members reported consuming unpasteurized milk from a local dairy. The

WDH Infectious Disease Epidemiology Program received a fifth report of a case of campylobacteriosis in a Park County resident. This patient, who had laboratory-confirmed *Campylobacter* infection, also reported consuming unpasteurized milk from the same local dairy. Further investigation revealed that another Park County child who had been confirmed with *Campylobacter* infection in June had also reported consumption of milk from this same dairy. A total of five confirmed cases and one probable case were associated with this outbreak; four of the six cases were children. One child was hospitalized. All five laboratory-confirmed cases were infected with *Campylobacter jejuni*, and these five *Campylobacter* isolates were genetically identical through PFGE. Other possible common exposures between the ill persons were investigated, but no other associations were noted. Milk samples from the dairy and from one ill person's refrigerated milk were analyzed, but none revealed the presence of *Campylobacter*. Wyoming Department of Agriculture regulations prohibit the sale or distribution of raw (unpasteurized) milk, and after inspecting the dairy, a Cease and Desist order was issued to the dairy prohibiting the sale or distribution of raw milk to employees or to the public. No other epidemiologically-related cases were reported after the Cease and Desist order was issued.

Household Cluster of Campylobacter jejuni Associated with Animal Contact, Uinta County, 2004

In July 2004, the WDH Infectious Disease Epidemiology Program identified a child from Uinta County with campylobacteriosis. Public health follow-up revealed that the patient's two siblings were also ill with symptoms consistent with campylobacteriosis, but their infections were not laboratory-confirmed. Contact with animals, particularly cattle, at both rodeo events and at home was suspected to be the source of the children's infections.

Outbreak of Campylobacter jejuni Associated with Raw Milk Consumption, Park County, 2005

In March 2005, the WDH Infectious Disease Epidemiology Program investigated a link between two cases of campylobacteriosis and consumption of milk from a local dairy in Park County. Two laboratory-confirmed cases of campylobacteriosis from separate households became ill in early March and reported consumption of raw milk from the same dairy prior to their illness. Milk samples were collected and tested negative for *Campylobacter*. Other possible links between the ill persons were investigated, but no other associations were noted. PFGE analysis of bacterial isolates from both case patients revealed an identical genetic match, which provides supporting evidence that the infections were from a common source. Neither of the two cases were hospitalized. Wyoming Department of Agriculture regulations prohibit the sale or distribution of raw (unpasteurized) milk. This outbreak was the second cluster of campylobacteriosis cases reporting raw milk exposures in less than a year. Both clusters occurred in the same county but involved different dairies.

Outbreak of Campylobacter jejuni Associated with a Drain-and-Fill Kiddie Pool, Converse County, 2005

In July 2005, the WDH Infectious Disease Epidemiology Program was notified of a single laboratory-confirmed case of campylobacteriosis. Through standard follow-up, an additional five cases (one laboratory confirmed, four probable) were identified. All cases attended a family gathering over the Fourth of July weekend at a family home in Converse County. The six cases included five children (three under two years of age) and one adult. Two of the cases were from Converse County and lived in the house where the gathering was held, two were from Natrona County, and two were from Colorado. The owner of the house reported having a shallow well, but did not report knowing anyone who drank water from the well. The most likely source of

illness was a drain-and-fill kiddie pool that had been filled with well water and had been utilized by all of the six case patients and the family dog.

Outbreak of Campylobacter jejuni in Extended Family Members Associated with Raw Milk Consumption, Uinta County, 2005

In July 2005, the WDH Infectious Disease Epidemiology Program was notified of a single laboratory-confirmed case of campylobacteriosis in a child from Uinta County. Public health follow-up revealed that the child and ten other extended family members were ill with symptoms consistent with campylobacteriosis after consuming unpasteurized milk from the families' dairy cow. Only one family member was not ill, and that individual had not consumed the unpasteurized milk. Of the eleven cases, one was laboratory-confirmed and ten were probable. Eight cases were children and three were adults. One child was hospitalized. Three separate households were affected; however, all three households shared unpasteurized milk from one dairy cow. The investigation revealed no other cases; ill persons were limited to those individuals who had consumed the unpasteurized milk.

Outbreak of Gastroenteritis with Multiple Etiologies Associated with Summer Camp, Albany County, 2006

In July 2006, the WDH Infectious Disease Epidemiology Program was notified by the U.S. Environmental Protection Agency (EPA) of a coliform-positive well sample taken from a summer camp in northeast Albany County and of rumored illness associated with campers at this venue. The Wyoming Department of Health, Wyoming Department of Agriculture, and Wyoming Department of Environmental Quality conducted an outbreak investigation that identified 139 ill persons (112 primary cases and 27 secondary cases) associated with the venue. Laboratory studies identified *Campylobacter jejuni* and noroviruses (genogroup I and II) as the etiologies of illnesses in 17 individuals. PFGE analysis on six *Campylobacter* isolates from ill patients showed that the *Campylobacter* infections were genetically identical. Extensive epidemiologic and environmental health studies identified the camp's contaminated well water system as the likely source of the infections. The camp was ordered closed until improvements were made to the camp's water and wastewater systems. (CDC. *Brief report: Gastroenteritis among attendees at a summer camp--Wyoming, June-July 2006*. MMWR 2007;56(15):368-70).

Outbreak of Campylobacter jejuni Associated with a Boys Residential Treatment Facility, Park County, 2007

In April 2007, the WDH Infectious Disease Epidemiology Program was notified by a local Park County physician of a cluster of gastrointestinal illness among adolescent residents of boys' residential treatment facility in Park County. A total of twelve ill individuals (eleven residents and one staff member) were identified by investigators. Two case patients tested positive for *Campylobacter jejuni*. No cases were hospitalized. Epidemiologic data suggested that contact with cattle was the most likely source of the bacterial infection, and the facility reported that some calves had experienced "scours" or calf-diarrhea. While contact with cattle, particularly ill calves, was the most likely source of illness, investigators could not rule out other potential routes of transmission (i.e. residents cooked meals for one another). Investigators did not find evidence that the facility's well systems were contaminated. The outbreak was limited to individuals associated with this facility.

Outbreak of Campylobacter jejuni in Extended Family, Goshen County, 2008

In November 2008, the WDH Infectious Disease Epidemiology Program was notified of two laboratory-confirmed cases of campylobacteriosis among family members from Goshen County. Routine public health follow-up revealed that three other members of the extended family were also ill with symptoms consistent with campylobacteriosis. Two separate households were affected, and family members report frequent visitation between the two households. Of the five cases, two were children and three were adults. No one was hospitalized. PFGE analysis of the *Campylobacter* isolates from the two laboratory-confirmed cases showed identical genetic relatedness among the infections. The investigation did not reveal other cases; ill persons were limited to the one extended family. A source of the infection was not identified. The last case to develop illness onset was suspected of being a secondary case who developed illness after caring for other ill family members. One ill family member was found to be a foodhandler at a local restaurant and was subsequently excluded from work until she was asymptomatic, a routine measure to protect the public's health.

Cryptosporidiosis

Case definition

- Confirmed – a case that has clinically compatible illness and is laboratory confirmed by one of the following methods:
 - Organisms identified in stool, intestinal fluid, or tissue samples or biopsy specimens
 - Antigens in stool or intestinal fluid, or
 - Nucleic acid by PCR in stool, intestinal fluid, or tissue samples or biopsy specimens
- Probable – a clinically compatible case that is epidemiologically-linked to a laboratory-confirmed case

Summary

From 2003-2008, 163 cases of cryptosporidiosis were reported to the WDH Infectious Disease Epidemiology Program (5.36 cases per 100,000 per year). Of the cases reported, 143 (87.7%) were laboratory-confirmed and 20 (12.3%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of cryptosporidiosis in Wyoming was statistically greater than the estimated US incidence (3.7 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System (SIR: 1.45, 95%CI: 1.23-1.67). The median age of cases of cryptosporidiosis was 14 years (range: 0-88 years). Persons aged 0-4 years had the highest age-specific incidence rate (3.63 cases per 100,000 per year). Cases were more likely to be male (55.2%) than female (44.8%). Recreational water exposure was the most common source of *Cryptosporidium* infection reported and was the suspected source of infection in 46.0% of all cases. A definitive source of the infection could not be determined in nearly 37% of all cases.

Crook County reported the highest age-adjusted incidence rate (58.99 cases per 100,000 per year), which was eleven times greater than the expected statewide incidence rate (5.36 cases per 100,000 per year). In addition to Crook County, Campbell County (33.39 cases per 100,000 per year) and Hot Springs County (50.08 cases per 100,000 per year) had incidence rates that were statistically greater than the statewide incidence rate. Goshen, Niobrara, Park, Platte and Teton Counties did not report any cases of cryptosporidiosis in the time period of interest. Albany, Carbon, Converse, Fremont, Laramie, Natrona, Sheridan, Sweetwater, Uinta and Washakie Counties all report incidence rates that are statistically lower than the statewide incidence rate. All other counties had age-adjusted incidence rates that were statistically equivalent to the statewide incidence rate.

Table 16: Occurrence of Cryptosporidiosis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	5	4	3	51	58	22	143
Probable	0	0	0	2	15	3	20
Total	5	4	3	53	73	25	163

Figure 9: Occurrence of Cryptosporidiosis by Year Reported, Wyoming, 2003-2008

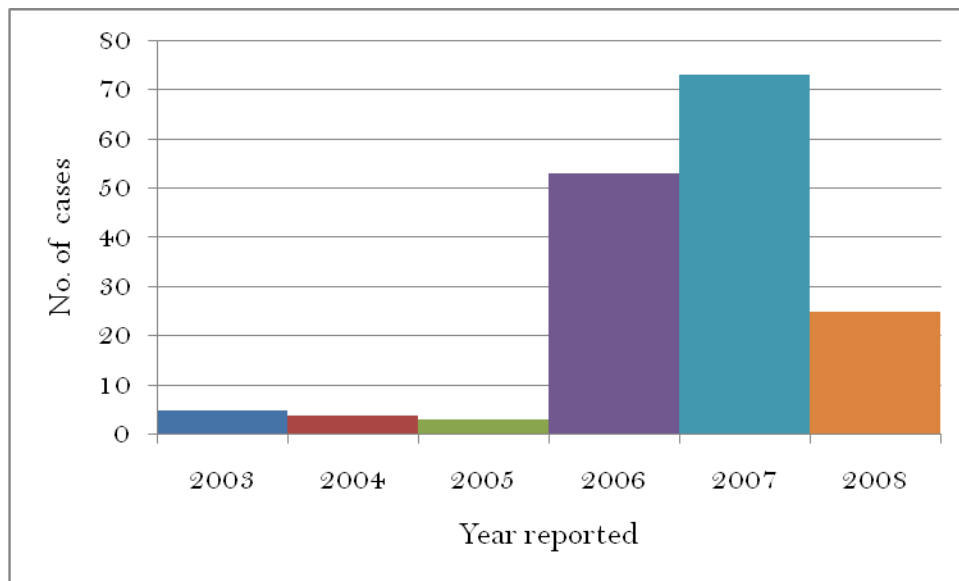


Figure 10: Incidence of Cryptosporidiosis by Month Reported, Wyoming, 2003-2008

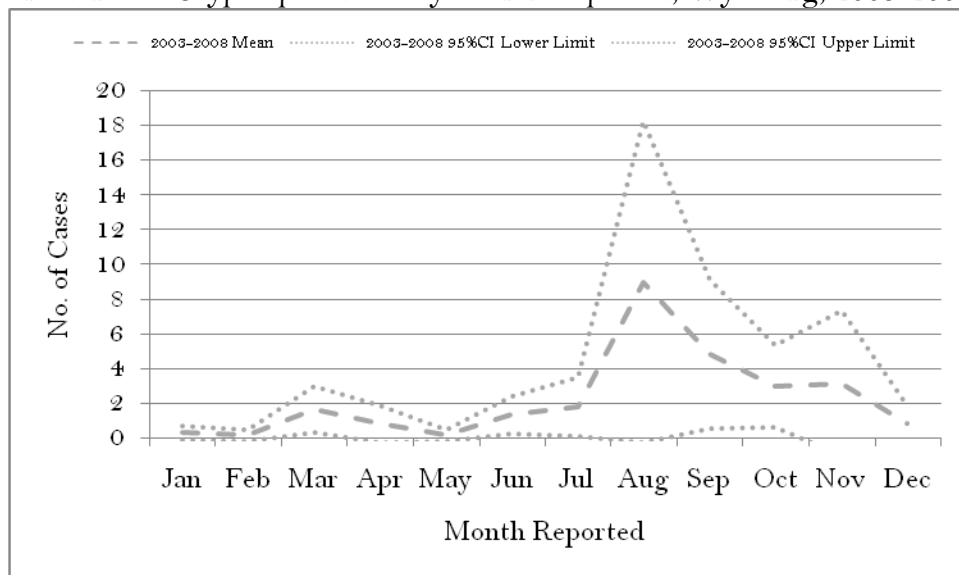


Table 17: Demographics of Case Patients with Cryptosporidiosis (N=163), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	1	2	2	16	18	5	44 (27.0%)
5-14 years	0	1	0	14	18	3	36 (22.1%)
15-24 years	0	1	0	3	7	3	14 (8.6%)
25-39 years	2	0	0	15	14	7	38 (23.3%)
40-64 years	2	0	0	4	7	4	17 (10.4%)

≥65 years	0	0	1	1	5	1	8 (4.9%)
Unknown	0	0	0	0	4	2	6 (3.7%)
Median age	36 yrs	8.5 yrs	3 yrs	12 yrs	13.5 yrs	25 yrs	14 yrs
Age range:	1-46 yrs	2-18 yrs	3-74 yrs	0-72 yrs	0-88 yrs	0-81 yrs	0-88 yrs
Gender							
Female	3	0	1	26	33	10	73 (44.5%)
Male	2	4	2	27	40	15	90 (55.2%)
Hospitalized							
Yes	0	1	0	7	3	1	12 (7.4%)
No	4	3	0	43	70	24	144 (88.3%)
Unknown	1	0	3	3	0	0	7 (4.3%)
Median no. of days hospitalized	0 days	0 days	0 days	2 days	6 days	–	2 days
Range of no. of days hospitalized	–	–	–	2-4 days	6 days	–	2-6 days
Outbreak status							
Outbreak/ cluster related	0	0	0	43	37	3	83 (50.9%)

Figure 11: Age Distribution of Cases of Cryptosporidiosis (N=163), Wyoming, 2003-2008

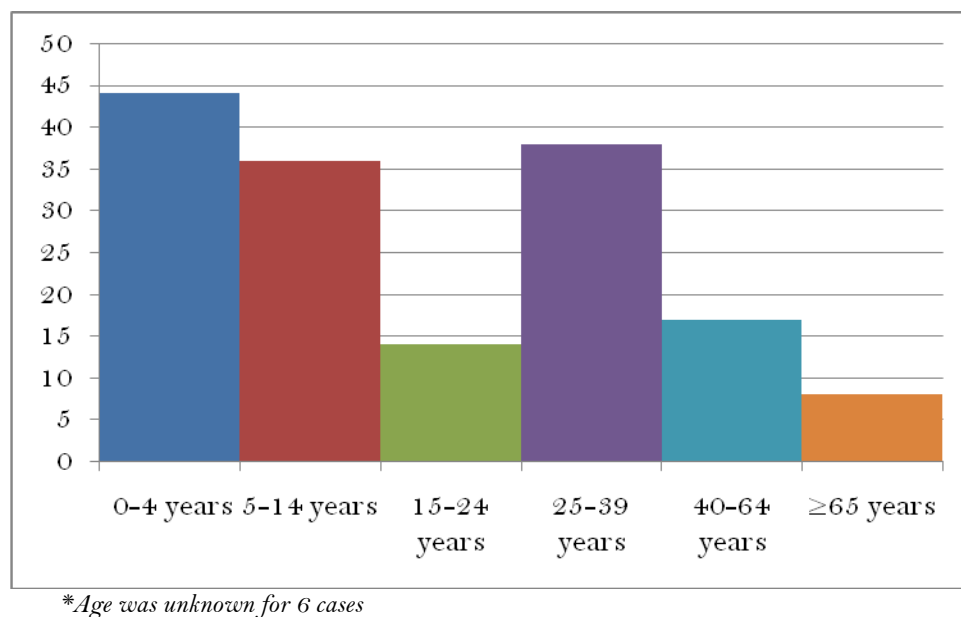


Table 18: Crude and Age-adjusted Incidence of Cryptosporidiosis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	3	1.54	1.92	0.36 (-0.05-0.76)§
Big Horn	8	11.95	13.29	2.48 (0.76-4.20)
Campbell	80	35.47	33.39	6.23 (4.86-7.59)§
Carbon	1	1.11	1.18	0.22 (-0.21-0.65)§
Converse	1	1.34	1.27	0.24 (-0.23-0.70)§
Crook	22	60.57	58.99	11.01 (6.41-15.61)§
Fremont	1	0.46	0.43	0.08 (-0.08-0.24)§
Goshen	0	0.00	0.00	—
Hot Springs	13	47.64	50.08	9.34 (4.26-14.42)§
Johnson	4	8.69	5.63	1.05 (0.02-2.08)
Laramie	2	0.39	0.38	0.07 (-0.03-0.17)§
Lincoln	10	10.97	11.58	2.16 (0.82-3.50)
Natrona	5	1.21	1.20	0.22 (0.03-0.42)§
Niobrara	0	0.00	0.00	—
Park	0	0.00	0.00	—
Platte	0	0.00	0.00	—
Sheridan	1	0.61	0.47	0.09 (-0.08-0.26)§
Sublette	4	9.57	9.77	1.82 (0.04-3.61)
Sweetwater	5	2.22	2.35	0.44 (0.05-0.82)§
Teton	0	0.00	0.00	—
Uinta	1	0.85	0.88	0.16 (-0.16-0.49)§
Washakie	1	2.15	2.42	0.45 (-0.43-1.34)
Weston	1	2.52	2.92	0.55 (-0.52-1.61)
Total	163	5.36	5.37	1.45 (1.23-1.67)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 3.7 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 19: Clinical Characteristics among Cases of Cryptosporidiosis, Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	5	3	0	49	63	24	144 (88.3%)
No	0	0	0	1	4	0	5 (3.1%)
Unknown	0	1	3	3	6	1	14 (8.6%)
Received antiparasitic							
Yes	2	2	0	25	33	12	74 (45.4%)
No	1	0	0	3	39	8	51 (31.3%)
Unknown	2	2	3	25	1	5	38 (23.3%)

Table 20: Most Likely Source of Infection among Cases of Cryptosporidiosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Recreational water	1	0	0	25	45	4	75 (46.0%)
Unknown source	2	2	3	24	17	12	60 (36.8%)
Secondary transmission	0	0	0	3	7	0	10 (6.1%)
Animal source	1	2	0	0	0	3	6 (3.7%)
Daycare-associated	1	0	0	0	1	2	4 (2.5%)
Other water	0	0	0	1	2	1	4 (2.5%)
Drinking water	0	0	0	0	1	2	3 (1.8%)
Foreign travel	0	0	0	0	0	1	1 (0.6%)

Likely exposures are determined by making a “best guess” by trained epidemiologists based on the case patient’s exposure history and should not be viewed as a definitive source of infection.

Table 21: Frequency of Other Exposures among Cases of Cryptosporidiosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Ate at any restaurant	2	2	0	22	46	17	89 (54.6%)
Ate at any fast food restaurant	1	0	0	12	33	13	59 (36.4%)
Consumed water from a private well	2	2	0	9	9	12	34 (20.9%)
Swam in treated water venue	0	0	0	21	41	8	70 (42.9%)
Swam in untreated water venue	1	0	0	19	16	4	40 (24.5%)
Attended daycare	1	0	0	3	5	4	13 (8.0%)
Live with daycare attendee	0	0	0	0	1	3	4 (2.5%)
Out of state travel	0	0	0	15	13	11	39 (23.9%)
International travel	0	0	0	0	1	1	2 (1.2%)

Percentages can add up to more than 100% because case patients can report more than one of these exposures.

Table 22: Frequency of Reported High-Risk Occupations among Cases of Cryptosporidiosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Food-handling employee	0	1	0	1	1	0	3 (1.8%)
Healthcare worker with direct patient contact	0	0	0	0	2	1	3 (1.8%)
Daycare worker	0	0	0	0	1	0	(0.6%)

Public health guidelines call for the exclusion of these individuals from their high-risk occupational setting until 48 hours has passed since the last bout of diarrhea or vomiting, whichever occurs last.

Outbreaks of Cryptosporidiosis, 2003-2008

Outbreaks of Cryptosporidium parvum, Campbell and Crook Counties, 2006

From June 1, 2006 to October 19, 2006, the WDH Infectious Disease Epidemiology Program identified an increase in *Cryptosporidium* infections in residents of Campbell and Crook Counties. A total of 35 confirmed cases and five probable cases were reported throughout the summer of 2006. The epidemiologic investigation revealed several risk factors statistically associated with illness: swimming in any pool, swimming in Keyhole Reservoir, and swimming in the Gillette city pool. The median age of the case patients was eleven years. Public and pool operator education was conducted to put prevention and control measures in place. (CDC.

Cryptosporidiosis outbreaks associated with recreational water use--five states, 2006. MMWR 2007;56(29):729-32).

Community Wide Outbreak of Cryptosporidium parvum Associated with Swimming Pool Use, Campbell County, 2007

A total of 30 cases of cryptosporidiosis in Campbell County were investigated by the WDH Infectious Disease Epidemiology Program from mid July through mid September 2007. The number of cases investigated marked a substantial increase in cases reported compared to the previous five-year average. Routine follow-up revealed multiple common exposures among case patients. Swimming in community swimming pools and exposure to Keyhole Reservoir were common exposures reported by case patients. Accidental fecal releases at local pools may have contributed to the spread of the illness. The WDH Infectious Disease Epidemiology Program worked cooperatively with the Wyoming Department of Agriculture Consumer Health Services and the local pools to implement nightly hyperchlorination (raising chlorine level to 20ppm or higher) to reduce the risk of transmitting the parasite. The number of reported cases dropped significantly after hyperchlorination was implemented; however, investigators cannot attribute the decrease in cases to the hyperchlorination efforts with certainty because one pool had closed for the season and pool use drastically decreased due to schools re-opening. This community-wide outbreak mirrored an outbreak of cryptosporidiosis that occurred in both Campbell and Crook Counties in 2006. Investigators suspect that persons with undiagnosed infections and asymptomatic carriers may have contributed to the reemergence of *Cryptosporidium* in Campbell County in 2007.

Cyclosporiasis

Case definition

- Confirmed, symptomatic - a laboratory-confirmed case associated with at least one of the following symptoms, watery diarrhea, loss of appetite, weight loss, abdominal bloating and cramping, increased flatus, nausea, fatigue, and low-grade fever.
Laboratory confirmation is defined as the detection of Cyclospora oocysts:
 - By microscopic examination of stool, intestinal fluid or small bowel biopsy specimens, or
 - By demonstration of sporulation, or
 - By identification of Cyclospora DNA via polymerase chain reaction (PCR) in stool, duodenal/jejuna aspirates or small bowel biopsy specimens
- Confirmed, asymptomatic: a laboratory-confirmed case (via the above described laboratory techniques) associated with none of the above symptoms.

Summary

From 2003-2008, no cases of cyclosporiasis were reported to the WDH Infectious Disease Epidemiology Program (0.00 cases per 100,000 per year). The incidence of cyclosporiasis in Wyoming was statistically equivalent to the estimated US incidence (0.03 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System.

Outbreaks of Cyclosporiasis

The WDH Infectious Disease Epidemiology Program did not investigate any outbreaks of cyclosporiasis in 2003 through 2008.

***Escherichia coli*, shiga toxin-producing (O157:H7, non-O157, or untyped)**

Case definition

- Confirmed – a case that meets the laboratory criteria for diagnosis. When available, O and H antigen serotype characterization should be reported.
 - Isolation of Shiga toxin-producing *Escherichia coli* from a clinical specimen. *Escherichia coli* O157:H7 isolates may be assumed to be Shiga toxin-producing. For all other *E. coli* isolates, Shiga toxin production or the presence of Shiga toxin genes must be determined to be considered STEC.
- Probable
 - A case with isolation of *E. coli* O157 from a clinical specimen, without confirmation of H antigen or Shiga toxin production, or
 - A clinically compatible case that is epidemiologically linked to a confirmed or probable case, or
 - Identification of an elevated antibody titer to a known Shiga toxin-producing *E. coli* serotype from a clinically compatible case
- Suspect
 - A case of postdiarrheal HUS or TTP, or
 - Identification of Shiga toxin in a specimen from a clinically compatible case without the isolation of the Shiga toxin-producing *E. coli*.

**The case definition for STEC changed in 2000 to include all types of shiga-toxin producing E. coli infections, not just infections caused by E. coli O157:H7. The case definition changed again in 2005 to include classification for the identification of the shiga-toxin in the presence or absence of isolation of the bacteria.*

Summary

From 2003-2008, 87 cases of shiga-toxin producing *Escherichia coli* (STEC) were reported to the WDH Infectious Disease Epidemiology Program (2.86 cases per 100,000 per year). Of the cases reported, 81(93.1%) were laboratory-confirmed and six (6.9%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of STEC in Wyoming was statistically greater than the estimated US incidence (1.12 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System (SIR: 2.63, 95%CI: 2.08-3.18). The median age of cases of STEC was eleven years (range: 0-82 years). Persons aged 0-4 years had the highest age-specific incidence rate (13.35 cases per 100,000 per year). Cases were more likely to be male (52.9%) than female (47.1%). A definitive source of infection was not found for two-thirds (66.7%) of all cases. A zoonotic source of infection was suspected in nearly 14.0% of cases.

Niobrara County reported the highest age-adjusted incidence rate (26.37 cases per 100,000 per year), which was nine times greater than the expected statewide incidence rate (2.86 cases per 100,000 per year); however this difference was not statistically significant due to a small number of cases being reported. Lincoln County (14.96 cases per 100,000 per year) and Sweetwater County (6.25 cases per 100,000 per year) had incidence rates that were statistically greater than the statewide incidence rate. Big Horn, Carbon, Crook, Hot Springs, Sheridan and Washakie Counties did not report cases during the time period of interest. Laramie and Natrona Counties report incidence rates that are statistically lower than the statewide

incidence rate. All other counties had age-adjusted incidence rates that were statistically equivalent to the statewide incidence rate.

Table 23: Occurrence of Shiga-Toxin Producing *Escherichia coli* Infections (O157:H7, non-O157, or untyped) by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	5	17	9	20	21	9	81 (93.1%)
Probable	0	0	1	0	2	3	6 (6.9%)
Total	5	17	10	20	23	12	87

Figure 12: Occurrence of Shiga-Toxin Producing *Escherichia coli* Infections (O157:H7, non-O157, or untyped) by Year Reported, Wyoming, 2003-2008

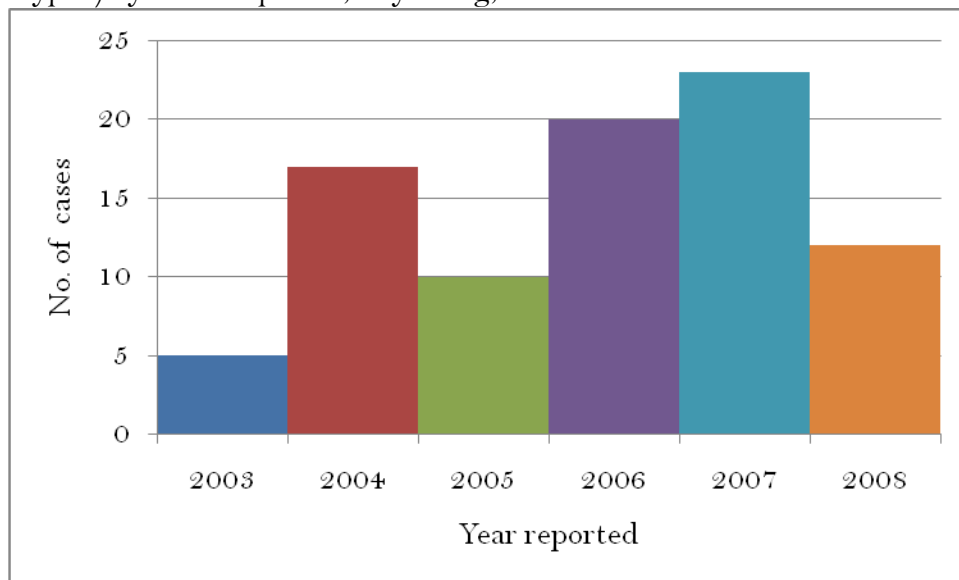


Figure 13: Incidence of Shiga-Toxin Producing *Escherichia coli* Infections (O157:H7, non-O157, or untyped) by Month Reported, Wyoming, 2003-2008

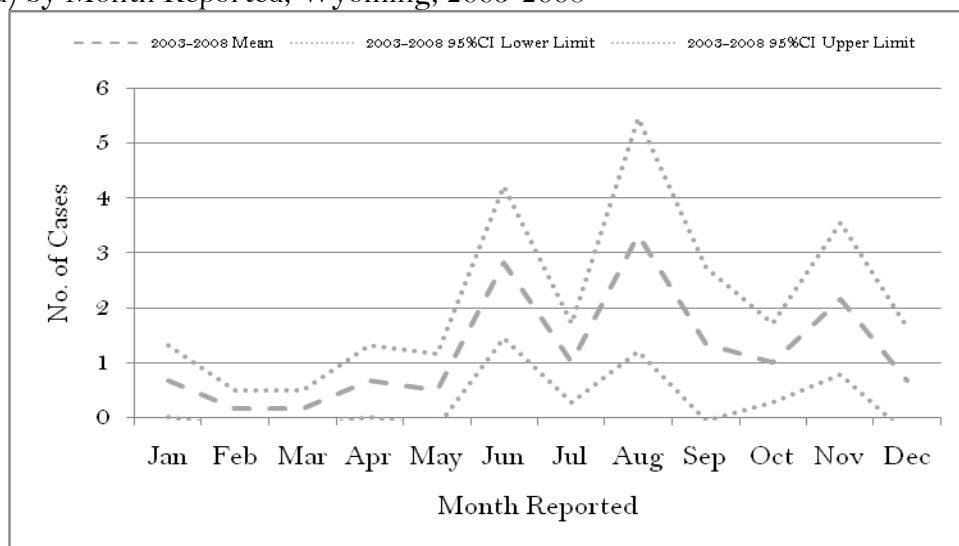


Table 24: Demographics of Case Patients with Shiga-Toxin Producing *Escherichia coli* Infections (O157:H7, non-O157, or untyped) (N=87), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	0	9	4	1	8	5	27 (31.0%)
5-14 years	2	4	1	6	7	1	21 (24.1%)
15-24 years	0	2	1	1	3	2	9 (10.3%)
25-39 years	0	2	2	3	4	2	13 (14.9%)
40-64 years	2	0	2	3	1	2	10 (11.5%)
≥65 years	1	0	0	6	0	0	7 (8.1%)
Unknown	0	0	0	0	0	0	0 (0.0%)
Median age	44yrs	4 yrs	17 yrs	32 yrs	7 yrs	10 yrs	11 yrs
Age range:	5-82 yrs	0-34 yrs	0-48 yrs	1-82 yrs	0-62 yrs	0-64 yrs	0-82 yrs
Gender							
Female	5	6	7	8	13	2	41 (47.1%)
Male	0	11	3	12	10	10	46 (52.9%)
Hospitalized							
Yes	3	5	1	9	4	4	26 (29.9%)
No	2	11	9	10	18	8	58 (66.7%)
Unknown	0	1	0	1	1	0	3 (3.5%)
Median no. of days hospitalized	2 days	3 days	2 days	3 days	3.5 days	3 days	3 days
Range of no. of days hospitalized	1-3 days	2-20 days	2 days	1-4 days	2-7 days	3 days	1-20 days
Outbreak status							
Outbreak/ cluster related	0	7	0	1	10	0	18 (20.7%)

Figure 14: Age Distribution of Cases of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped) (N=87), Wyoming, 2003-2008

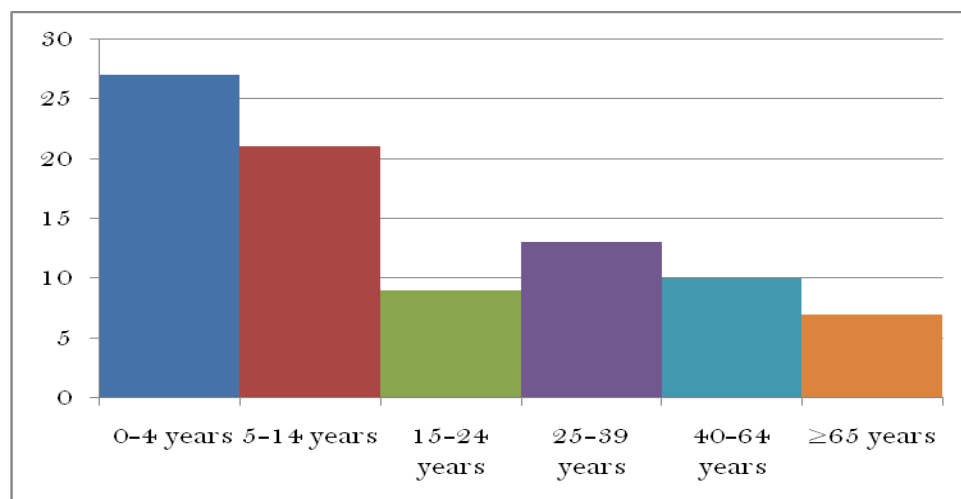


Table 25: Crude and Age-adjusted Incidence of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped) by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	3	1.54	2.10	0.73 (-0.10-1.56)
Big Horn	0	0.00	0.00	—
Campbell	6	2.66	2.48	0.87 (0.17-1.56)
Carbon	0	0.00	0.00	—
Converse	1	1.34	1.21	0.42 (-0.41-1.25)
Crook	0	0.00	0.00	—
Fremont	4	1.82	1.76	0.62 (0.01-1.22)
Goshen	7	9.66	10.34	3.62 (0.94-6.29)
Hot Springs	0	0.00	0.00	—
Johnson	1	2.17	2.29	0.80 (-0.77-2.37)
Laramie	7	1.37	1.28	0.45 (0.12-0.78)§
Lincoln	14	15.35	14.96	5.23 (2.49-7.97)§
Natrona	2	0.48	0.48	0.17 (-0.06-0.40)§
Niobrara	2	14.93	26.37	9.22 (-3.56-22.00)
Park	6	3.78	3.50	1.22 (0.24-2.20)
Platte	6	11.77	11.93	4.17 (0.83-7.51)
Sheridan	0	0.00	0.00	—
Sublette	4	9.57	10.15	3.55 (0.07-7.02)
Sweetwater	15	6.65	6.25	2.19 (1.08-3.29)§
Teton	6	5.15	6.25	1.98 (0.40-3.57)
Uinta	2	1.70	1.56	0.55 (-0.21-1.30)
Washakie	0	0.00	0.00	—
Weston	1	2.52	2.92	1.02 (-0.98-3.03)
Total	87	2.86	2.95	2.63 (2.08-3.18)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 1.12 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 26: Clinical Characteristics among Cases of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	5	15	9	19	21	12	81 (93.1%)
No	0	0	0	0	0	0	0 (0.0%)
Unknown	0	2	1	1	2	0	6 (6.9%)
Specimen source							
Stool	5	17	9	20	21	9	81 (93.1%)
Blood	0	0	0	0	0	0	0 (0.0%)
Unspecified	0	0	1	0	2	3	6 (6.9%)
Bacterial isolate was confirmed at WPHL*							
Yes	3	13	7	16	18	7	64 (73.6%)

No	2	4	3	4	5	5	23 (26.4%)
E. coli subtypes (N=66)							
O157:H7	3	10	7	11	18	2	51 (79.7%)
O26:H11	0	3	0	1	1	0	5 (7.8%)
O26, unspecified	0	0	0	0	0	3	3 (4.7%)
O103:H2	0	1	0	1	0	0	2 (3.1%)
O121:H19	0	0	0	2	0	0	2 (3.1%)
O103:H11	0	0	0	0	0	1	1 (1.6%)
O145:NM	0	0	1	0	0	0	1 (1.6%)
O157:NM	0	1	0	0	0	0	1 (1.6%)
Received antibiotic							
Yes	2	1	3	7	8	4	25 (28.7%)
No	2	11	4	7	11	6	41 (47.1%)
Unknown	1	5	3	6	4	2	21 (24.1%)

Table 27: Most Likely Source of Infection among Cases of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped), Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Unknown source	3	14	7	14	12	8	58 (66.7%)
Animal source	0	2	3	3	1	3	12 (13.8%)
Recreational water	0	0	0	0	6	0	6 (6.9%)
Food at home	2	1	0	0	1	0	4 (4.6%)
Foreign travel	0	0	0	1	0	1	2 (2.3%)
Multiple sources	0	0	0	0	2	0	2 (2.3%)
Food at restaurant	0	0	0	1	0	0	1 (1.2%)
Raw milk	0	0	0	0	1	0	1 (1.2%)
Secondary transmission	0	0	0	1	0	0	1 (1.2%)

Likely exposures are determined by making a "best guess" by trained epidemiologists based on the case patient's exposure history and should not be viewed as a definitive source of infection.

Table 28: Frequency of Other Exposures among Cases of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped), Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Ate at any restaurant	2	12	8	19	20	8	69 (79.3%)
Ate at any fast food restaurant	1	7	3	9	15	6	41 (47.1%)
Consumed water from a private well	3	6	3	8	11	2	33 (37.9%)
Swam in treated water venue	3	0	0	4	10	3	20 (23.0%)
Swam in untreated water venue	0	0	0	2	5	0	7 (8.0%)
Attended daycare	1	1	0	0	0	2	4 (4.6%)
Live with daycare attendee	0	0	0	0	0	1	1 (1.2%)
Out of state travel	1	4	3	7	9	6	30 (34.5%)
International travel	0	1	0	1	0	1	3 (3.5%)

Percentages can add up to more than 100% because case patients can report more than one of these exposures.

Table 29: Frequency of Reported High-Risk Occupations among Cases of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped), Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Food-handling employee	0	0	1	0	0	0	1 (1.2%)
Healthcare worker with direct patient contact	0	0	0	0	0	0	0 (0.0%)
Daycare worker	0	0	0	0	0	0	0 (0.0%)

Public health guidelines call for the exclusion of these individuals from their high-risk occupational setting until two consecutively negative stool samples are acquired at least 72 hours after the cessation of antibiotics.

Outbreaks of Shiga-Toxin Producing *Escherichia coli* (O157:H7, non-O157, or untyped), 2003-2008

Enterohemorrhagic E. coli non-O157 Cluster, Lincoln County, 2004

Between July and November 2004, the WDH received six reported cases of enterohemorrhagic *E. coli* from Lincoln County. An extensive food history questionnaire was conducted with the cases along with enhanced laboratory testing through the Wyoming Public Health Laboratory. Five of the six isolates were serotyped as *E. coli* O26:H11, the sixth was O103:H2. No common exposures were discovered.

Multistate Outbreak of E. coli O157:H7 Associated with Fresh Spinach, 2006

In September 2006, the CDC identified an outbreak of *E. coli* O157:H7 associated with fresh spinach. A total of 205 cases from 26 states were identified to be related to the outbreak. At least 31 case patients developed hemolytic uremic syndrome (HUS) and three deaths were reported. Traceback investigations revealed that the contaminated spinach came from one area in California and environmental health investigations identified several possible avenues from the spinach to become contaminated. One confirmed case from Fremont County was found to be associated through laboratory evidence with this outbreak. The WDH Infectious Disease Epidemiology Program was unable to confirm whether or not the case ate the implicated fresh spinach. (Wendel, et al. *Multistate outbreak of Escherichia coli O157:H7 infection associated with consumption of packaged spinach, August-September 2006: the Wisconsin investigation*. Clin Infect Dis 2009; 48(8):1079-1086).

Multistate Outbreak of E. coli O157:H7 Associated with Ground Beef, 2007

In May 2007, the WDH Infectious Disease Epidemiology Program identified a case of *E. coli* O157:H7 in Sweetwater County with a PFGE pattern that matched five other cases in the Western United States, including Arizona, California, Colorado, and Utah. The WDH Infectious Disease Epidemiology contacted representatives from all states with cases to discuss possible common exposures. The Colorado case patient reported eating ground beef purchased at the same grocery store chain as the Wyoming case patient, and the Colorado and California Departments of Health proceeded to collect samples of ground beef from their case patients. On May 30, 2007, ground beef samples from case patients in California and Colorado tested positive for *E. coli* O157:H7, and the bacterial PFGE patterns from those beef samples were identical to the case patients' PFGE patterns. On June 4, 2007, the USDA issued a class I recall of ground beef from one California-based distributor. The initial recall included 75,000 lbs of beef, and an expanded recall issued on June 9, 2007 included an additional 370,000 lbs of beef. A total of 16 cases in six Western states were identified to be associated with the outbreak.

Giardiasis

Case definition

- Confirmed – a case that is laboratory confirmed via one of the following methods:
 - Demonstration of *G. lamblia* cysts in stool, or
 - Demonstration of *G. lamblia* trophozoites in stool, duodenal fluid, or small-bowel biopsy, or
 - Demonstration of *G. lamblia* antigen in stool by a specific immunodiagnostic test (e.g., enzyme-linked immunosorbent assay)
- Probable – a clinically compatible case that is epidemiologically linked to a confirmed case

Summary

From 2003-2008, 219 cases of giardiasis were reported to the WDH Infectious Disease Epidemiology Program (7.20 cases per 100,000 per year). Of the cases reported, 210 (95.9%) were laboratory-confirmed and 9 (4.1%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of giardiasis in Wyoming was statistically equivalent to the estimated US incidence (6.31 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System (SIR: 1.13, 95%CI: 0.98-1.28). The median age of cases of giardiasis was 31 years (range: 0-93 years). Persons aged 0-4 years had the highest age-specific incidence rate (17.80 cases per 100,000 per year). Cases were more likely to be male (51.6%) than female (48.4%). A suspected source of infection was not found for approximately half (50.2%) of all cases. Exposure to recreational water was found to be the source of infection for 13.2% of cases.

Crook County reported the highest age-adjusted incidence rate (29.02 cases per 100,000 per year), which was four times greater than the expected statewide incidence rate (7.20 cases per 100,000 per year). In addition to Crook County, Sheridan County (16.41 cases per 100,000 per year) and Teton County (16.60 cases per 100,000 per year) had age-adjusted incidence rates that were statistically higher than the statewide rate. Niobrara County did not report any cases during the time period of interest. Carbon (2.19 cases per 100,000 per year), Laramie (3.42 cases per 100,000 per year), and Natrona (2.17 cases per 100,000 per year) Counties had age-adjusted incidence rates that were statistically lower than the statewide rate. All other counties had age-adjusted incidence rates that were statistically equivalent to the statewide incidence rate.

Table 30: Occurrence of Giardiasis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	23	27	30	36	49	45	210 (95.9%)
Probable	0	0	0	2	1	6	9 (4.1%)
Total	23	27	30	38	50	51	219 (100%)

Figure 15: Occurrence of Giardiasis by Year Reported, Wyoming, 2003-2008

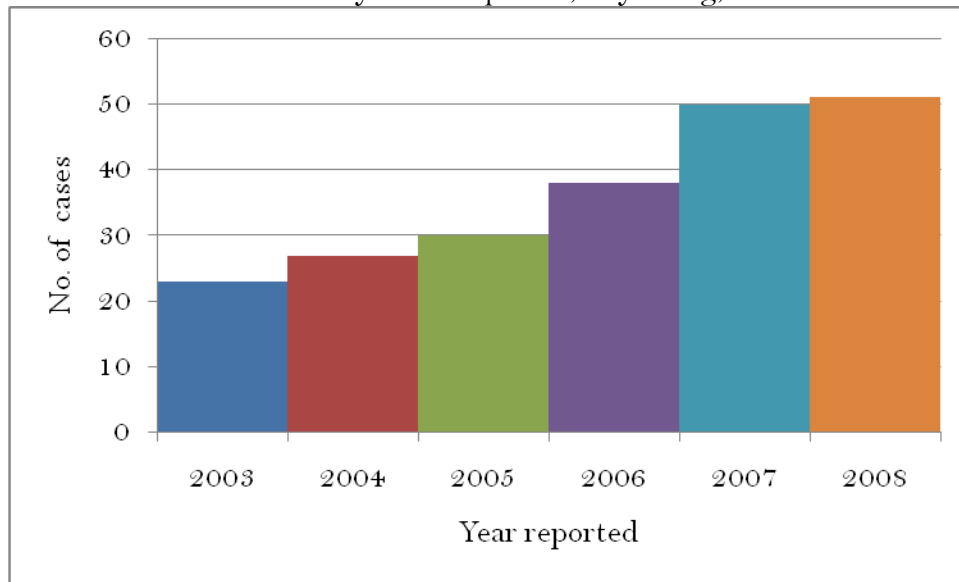


Figure 16: Incidence of Giardiasis by Month Reported, Wyoming, 2003-2008

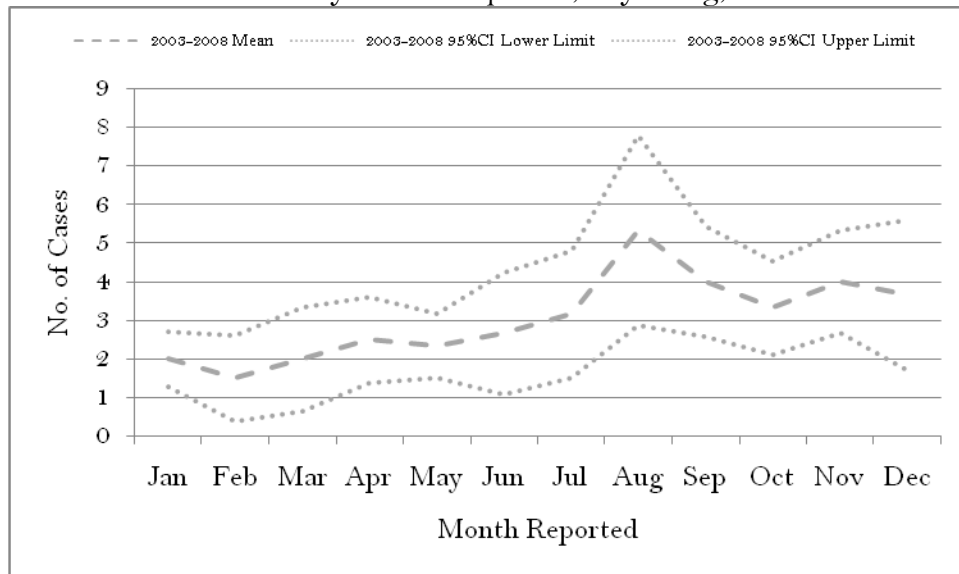


Table 31: Demographics of Case Patients with Giardiasis (N=219), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	3	3	7	7	5	11	36 (16.4%)
5-14 years	4	2	2	5	4	9	26 (11.9%)
15-24 years	4	4	4	2	5	3	22 (10.0%)
25-39 years	3	8	5	12	16	7	31 (14.2%)
40-64 years	7	3	10	6	14	17	57 (26.0%)
≥65 years	2	6	2	4	4	4	22 (10.0%)
Unknown	0	1	0	2	2	0	5 (2.3%)

Median age	26 yrs	34.5 yrs	29 yrs	29.5 yrs	35.5 yrs	27 yrs	31 yrs
Age range:	3-72 yrs	0-88 yrs	1-73 yrs	1-86 yrs	2-93 yrs	0-92 yrs	0-93 yrs
Gender							
Female	10	15	12	20	21	28	106 (48.4%)
Male	13	12	18	18	29	23	113 (51.6%)
Hospitalized							
Yes	2	2	4	2	5	0	15 (6.9%)
No	21	16	23	34	41	46	181 (82.7%)
Unknown	0	9	3	2	4	5	23 (10.5%)
Median no. of days hospitalized	—	—	1.0 day	1.0 day	5.0 days	—	1.5 days
Range of no. of days hospitalized	—	—	1.0 day	1.0 day	2-5 days	—	1-5 days
Outbreak status							
Outbreak/ cluster related	0	0	0	0	1	7	8 (3.7%)

Figure 17: Age Distribution of Cases of Giardiasis (N=219), Wyoming, 2003-2008

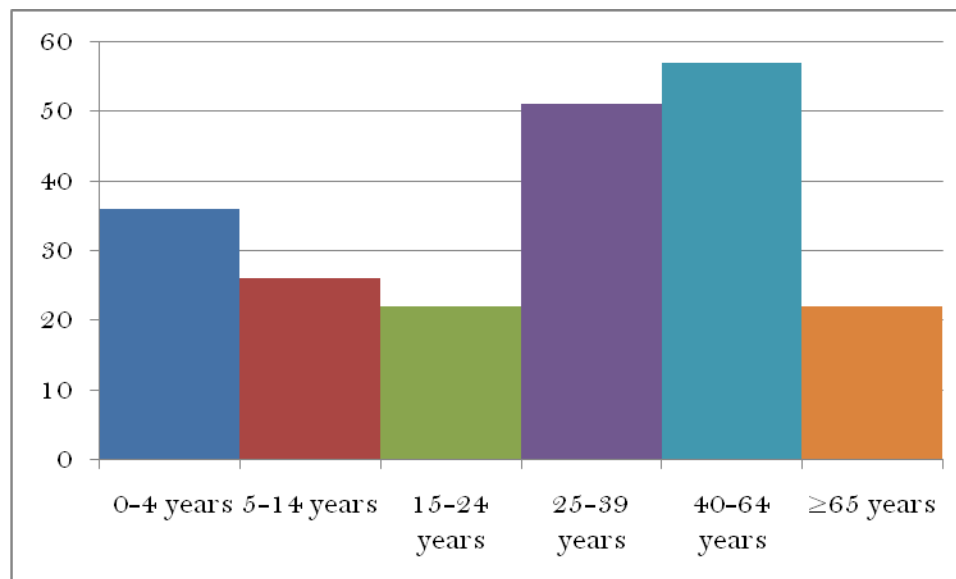


Table 32: Crude and Age-adjusted Incidence Rates of Giardiasis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	17	8.72	10.00	1.39 (0.73-2.05)
Big Horn	6	8.96	9.09	1.26 (0.25-2.27)
Campbell	16	7.09	7.03	0.98 (0.50-1.46)
Carbon	3	3.33	2.19	0.30 (-0.04-0.65)§
Converse	5	6.68	6.54	0.91 (0.11-1.70)
Crook	9	24.78	29.02	4.03 (1.40-6.66)§
Fremont	14	6.38	6.53	0.91 (0.43-1.38)
Goshen	4	5.52	6.30	0.87 (0.02-1.73)
Hot Springs	6	21.99	26.08	3.62 (0.72-6.52)
Johnson	6	13.04	14.07	1.95 (0.39-3.52)
Laramie	19	3.72	3.42	0.47 (0.26-0.69)§
Lincoln	10	10.97	10.54	1.46 (0.56-2.37)
Natrona	9	2.18	2.17	0.30 (0.10-0.50)§
Niobrara	0	0.00	0.00	—
Park	11	6.94	7.96	1.11 (0.45-1.76)
Platte	2	3.92	3.65	0.51 (-0.20-1.21)
Sheridan	26	15.87	16.41	2.28 (1.40-3.16)§
Sublette	5	11.96	9.52	1.32 (0.16-2.48)
Sweetwater	16	7.09	6.90	0.96 (0.49-1.43)
Teton	19	16.30	16.60	2.31 (1.27-3.34)§
Uinta	8	6.79	8.04	1.12 (0.34-1.89)
Washakie	4	8.59	7.68	1.07 (0.02-2.11)
Weston	3	7.57	6.92	0.96 (-0.13-2.05)
Total	219	7.20	7.11	1.13 (0.98-1.28)†

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 6.31 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 33: Clinical Characteristics among Cases of Giardiasis Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	17	15	23	33	40	41	169 (77.2%)
No	0	0	0	3	0	2	5 (2.3%)
Unknown	6	12	7	2	10	8	45 (20.6%)
Received antiparasitic							
Yes	15	10	19	26	26	28	124 (56.6%)
No	2	1	1	1	4	8	17 (7.8%)
Unknown	6	16	10	11	20	15	78 (35.6%)

Table 34: Most Likely Source of Infection among Cases of Giardiasis Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Unknown source	11	23	14	9	29	24	110 (50.2%)
Recreational water	8	2	7	0	7	5	29 (13.2%)
Foreign travel	2	1	2	4	9	10	28 (12.8%)
Water, other	1	0	0	21	3	3	28 (12.8%)
Drinking water	0	0	3	0	1	3	7 (3.2%)
Animal source	1	1	0	2	0	1	5 (2.3%)
Daycare	0	0	3	1	0	1	5 (2.3%)
Secondary transmission	0	0	1	1	0	3	2 (0.9%)
Food-restaurant	0	0	0	0	1	0	1 (0.5%)

Likely exposures are determined by making a "best guess" by trained epidemiologists based on the case patient's exposure history and should not be viewed as a definitive source of infection.

Table 35: Frequency of Other Exposures among Cases of Giardiasis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Ate at any restaurant	9	4	10	28	26	23	100 (45.7%)
Ate at any fast food restaurant	3	2	4	11	9	9	38 (17.4%)
Consumed water from a private well	2	3	9	9	10	9	42 (19.2%)
Swam in treated water venue	3	1	2	4	7	6	23 (10.5%)
Swam in untreated water venue	9	3	8	20	12	15	67 (30.6%)
Attended daycare	2	2	5	1	2	8	20 (9.1%)
Live with daycare attendee	2	1	0	2	4	7	16 (7.3%)
Out of state travel	4	4	3	11	17	21	60 (27.4%)
International travel	1	1	0	5	8	10	25 (11.4%)

Percentages can add up to more than 100% because case patients can report more than one of these exposures.

Table 36: Frequency of Reported High-Risk Occupations among Cases of Giardiasis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Food-handling employee	1	1	0	3	1	0	5 (2.3%)
Healthcare worker with direct patient contact	0	0	1	1	1	0	3 (1.4%)
Daycare worker	0	0	1	0	0	0	1 (0.5%)

Public health guidelines call for the exclusion of these individuals from their high-risk occupational setting until 48 hours after the cessation of diarrhea.

Outbreaks of Giardiasis, 2003-2008

Investigation of Illness Associated with RV Park, Sheridan County, 2008

In November 2008, WDH Infectious Disease Epidemiology Program began a cooperative investigation with the US Environmental Protection Agency and the Wyoming Department of Environmental Quality regarding reports of illness among past and current residents of a rural RV park in Sheridan County. Staff from the WDH Infectious Disease Epidemiology Program completed interviews on 27 RV park patrons; 22 reported recurring gastrointestinal illness. One person tested positive for giardiasis at an out-of-state laboratory. WDH was not been able to determine if the RV park's well water system was the source of the illness or if there are other possible sources. EPA continues to investigate problems with the RV park's well system, which was considered to be a public water system, and DEQ continues to investigate problems with the RV park's wastewater system. The presence of these problems suggests that water system was a potential source of illness.

Hepatitis A

Case definition

- Confirmed – An acute illness with a) discrete onset of symptoms and b) jaundice or elevated serum aminotransferase levels that is laboratory-confirmed via detection of immunoglobulin M (IgM) antibody to hepatitis A virus (anti-HAV IgM).
- Probable – a case that meets the clinical case definition (discrete onset of symptoms and jaundice or elevated serum aminotransferase levels) and occurs in a person who has an epidemiologic link to a person who has laboratory-confirmed hepatitis A infection (i.e., household or sexual contact with an infected person during the 15-50 days before the onset of symptoms)

Summary

From 2003-2008, 16 cases of acute Hepatitis A were reported to the WDH Infectious Disease Epidemiology Program (0.53 cases per 100,000 per year). Of the cases reported, 15 (93.8%) were laboratory-confirmed and one (6.3%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of acute Hepatitis A in Wyoming was statistically less than the estimated US incidence (1.20 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System (SIR: 0.43, 95%CI: 0.22-0.64). The median age of cases of acute Hepatitis A was 27 years (range: 5-74 years). Persons aged 15-24 years had the highest age-specific incidence rate (0.88 cases per 100,000 per year). Cases were more likely to be female (56.3%) than male (43.7%). Crook County reported the highest age-adjusted incidence rate (2.50 cases per 100,000 per year). While this rate was nearly five times the statewide incidence rate, it was not a statistically significant increase over the expected rate. Albany, Campbell, Converse, Fremont, Laramie, Natrona, Park, and Sheridan Counties also reported cases of acute Hepatitis A infection during the time period of interest.

Table 37: Occurrence of Acute Hepatitis A by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	2	5	1	2	3	2	15
Probable	0	0	0	1	0	0	1
Total	2	5	1	3	3	2	16

Figure 18: Occurrence of Acute Hepatitis A by Year Reported, Wyoming, 2003-2008

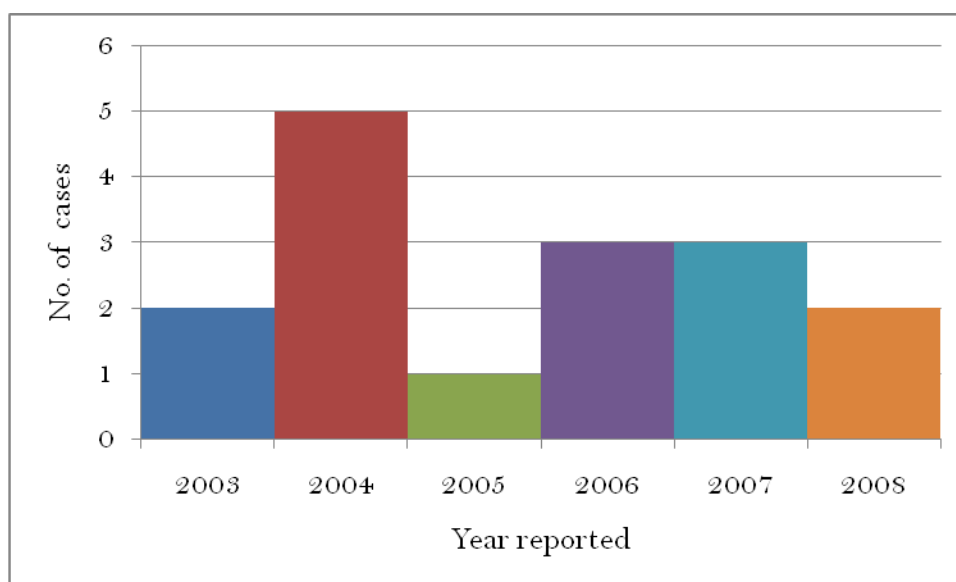


Figure 19: Incidence of Acute Hepatitis A by Month Reported, Wyoming, 2003-2008

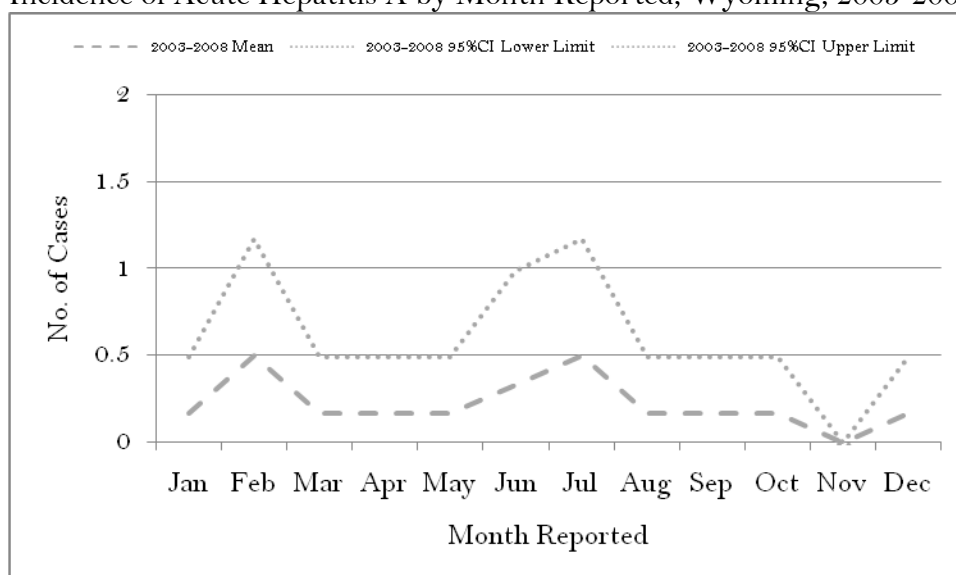


Table 38: Demographics of Case Patients with Acute Hepatitis A (N=16), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	0	0	0	0	0	0	0 (0.0%)
5-14 years	0	0	0	0	0	2	2 (12.5%)
15-24 years	1	0	0	3	0	0	4 (25.0%)
25-39 years	1	1	1	0	1	0	4 (25.0%)
40-64 years	0	3	0	0	2	0	5 (31.3%)
≥65 years	0	1	0	0	0	0	1 (6.3%)

Unknown	0	0	0	0	0	0	0 (0.0%)
Median age	24 yrs	53.5 yrs	26 yrs	20 yrs	42 yrs	7 yrs	27 yrs
Age range:	21-27 yrs	39-74 yrs	26 yrs	18-24 yrs	29-58 yrs	5-9 yrs	5-74 yrs
Gender							
Female	0	3	1	2	2	1	9 (56.3%)
Male	2	2	0	1	1	1	7 (43.8%)
Hospitalized							
Yes	0	0	0	0	1	0	1 (6.3%)
No	0	0	0	0	2	2	4 (25.0%)
Unknown	2	5	1	3	0	0	(68.8%)
Outbreak status							
Outbreak/ cluster related	0	0	0	0	0	2	2 (12.5%)

Figure 20: Age Distribution of Cases of Acute Hepatitis A (N=16), Wyoming, 2003-2008

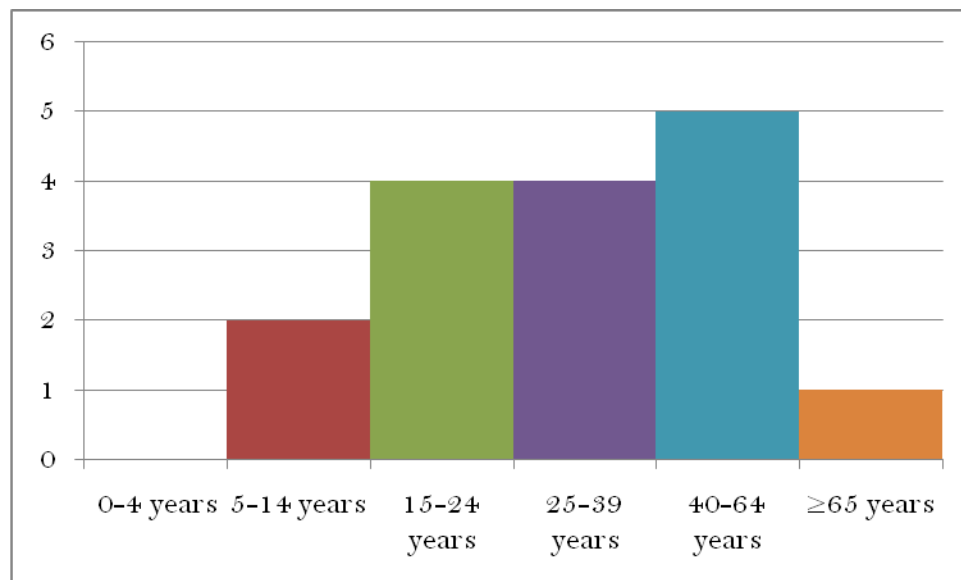


Table 39: Crude and Age-adjusted Incidence Rates of Acute Hepatitis A by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	1	0.51	0.74	1.40 (-1.35-4.16)
Big Horn	0	0.00	0.00	—
Campbell	1	0.44	0.40	0.75 (-0.72-2.22)
Carbon	0	0.00	0.00	—

Converse	1	1.34	1.21	2.29 (-2.20-6.77)
Crook	1	2.75	2.50	4.71 (-4.52-13.94)
Fremont	3	1.37	1.49	2.81 (-0.37-5.99)
Goshen	0	0.00	0.00	—
Hot Springs	0	0.00	0.00	—
Johnson	0	0.00	0.00	—
Laramie	4	0.78	0.71	1.52 (0.03-3.01)
Lincoln	0	0.00	0.00	—
Natrona	3	0.73	0.71	1.34 (-0.18-2.86)
Niobrara	0	0.00	0.00	—
Park	1	0.63	0.80	1.50 (-1.44-4.44)
Platte	0	0.00	0.00	—
Sheridan	1	0.61	0.56	1.06 (-1.02-3.15)
Sublette	0	0.00	0.00	—
Sweetwater	0	0.00	0.00	—
Teton	0	0.00	0.00	—
Uinta	0	0.00	0.00	—
Washakie	0	0.00	0.00	—
Weston	0	0.00	0.00	—
Total	16	0.53	0.52	0.43 (0.22-0.64)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 1.20 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Outbreaks of Acute Hepatitis A Infection, 2003–2008

Household Cluster of Hepatitis A Infection, Natrona County, 2008

In February 2008, the WDH Infectious Disease Epidemiology identified a laboratory-confirmed case of Hepatitis A in a child from Natrona County. The Casper Natrona County Health Department conducted routine epidemiologic follow-up on the case. At the time of the follow-up interview, no other household members were symptomatic. Household members were referred to both their local healthcare provider and the county health department of prophylaxis per recommended public health guidelines and received the vaccine over the next several days. Subsequently, the WDH Infectious Disease Epidemiology received a report confirming Hepatitis A infection in the index case patient’s sibling. The sibling’s onset date was shortly after follow-up, and this child was likely infected before receiving the dose of vaccine. The family had traveled to various locations in Mexico during the months of December and January. The sibling’s infection could have been primary (acquired from source in Mexico) or secondary (acquired from the index case). No other cases in the family were identified.

Legionellosis

Case definition

- Confirmed – a case that is laboratory confirmed via one of the following methods:
 - By culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid.
 - By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents.
 - By seroconversion: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.
- Suspect – a case where *Legionella* has been detected by the following methods:
 - By seroconversion: fourfold or greater rise in antibody titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1 (e.g., *L. micdadei*, *L. pneumophila* serogroup 6).
 - By seroconversion: fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigen and validated reagents.
 - By the detection of specific *Legionella* antigen or staining of the organism in respiratory secretions, lung tissue, or pleural fluid by direct fluorescent antibody (DFA) staining, immunohistochemistry (IHC), or other similar method, using validated reagents.
 - By detection of *Legionella* species by a validated nucleic acid assay

Summary

From 2003-2008, 15 cases of legionellosis were reported to the WDH Infectious Disease Epidemiology Program (0.49 cases per 100,000 per year). All 15 cases were laboratory-confirmed. The incidence of legionellosis in Wyoming was statistically less than the estimated US incidence (0.88 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System (SIR: 0.53, 95%CI: 0.26-0.80). The median age of cases of legionellosis was 51 years (range 26-75 years). Persons aged 40-64 years had the highest age-specific incidence rate (0.96 cases per 100,000 per year). Cases were more likely to be male (73.3%) than female (26.7%). A suspected source of infection was not found for approximately two-thirds (73.3%) of all cases. Two cases (13.3%) were suspected of acquiring the infection during a previous hospital visit, and two cases (13.3%) were suspected of acquiring the infection during out-of-state travel. Weston County reported the highest age-adjusted incidence rate (29.02 cases per 100,000 per year), which was nearly four times greater than the expected statewide incidence rate (0.49 cases per 100,000 per year). However, this difference was not statistically significant due to the small number of cases reported. Campbell, Carbon, Fremont, Goshen, Laramie, Natrona, Park, Sweetwater, and Uinta Counties also reported cases during the time period of interest.

Table 40: Occurrence of Legionellosis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	2	7	3	0	3	0	15
Probable	0	0	0	0	0	0	0
Total	2	7	3	0	3	0	15

Figure 21: Occurrence of Legionellosis by Year Reported, Wyoming, 2003-2008

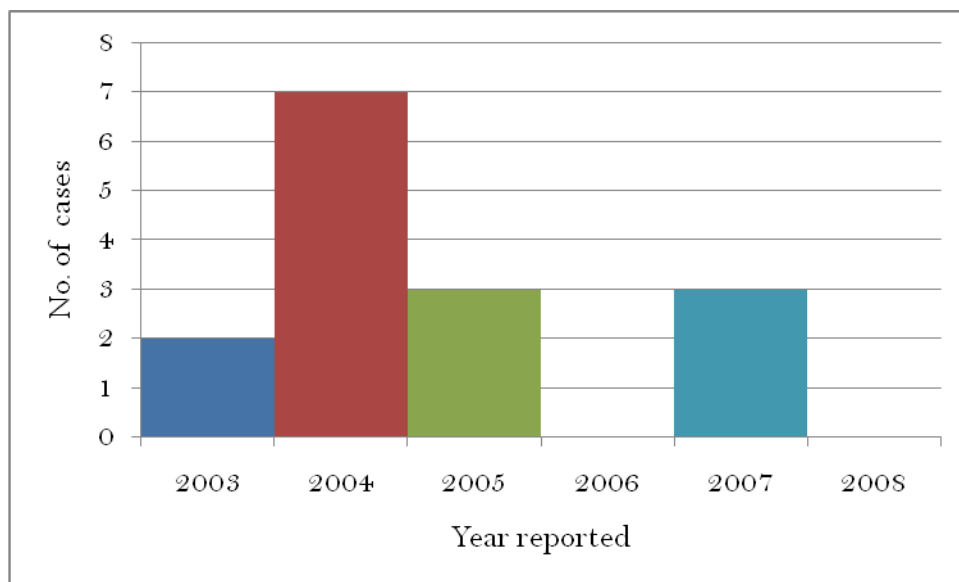


Figure 22: Incidence of Legionellosis by Month Reported, Wyoming, 2003-2008

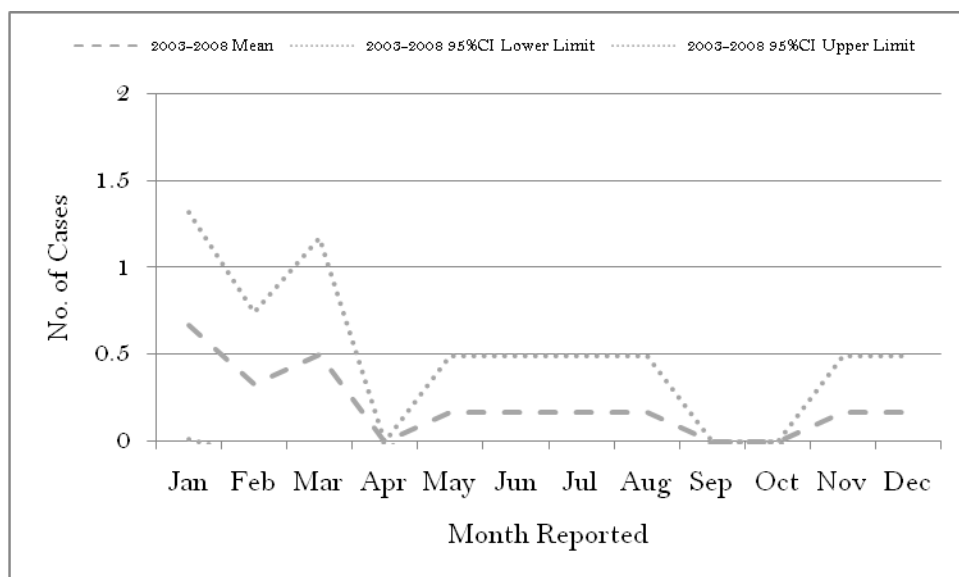


Table 41: Demographics of Case Patients with Legionellosis (N=15), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	0	0	0	0	0	0	0 (0.0%)
5-14 years	0	0	0	0	0	0	0 (0.0%)
15-24 years	0	0	0	0	0	0	0 (0.0%)
25-39 years	0	1	1	0	0	0	2 (13.3%)
40-64 years	2	5	1	0	2	0	10 (66.7%)
≥65 years	0	1	1	0	1	0	3 (20.0%)
Unknown	0	0	0	0	0	0	0 (0.0%)
Median age	60 yrs	51 yrs	55 yrs	—	50 yrs	—	51 yrs
Age range:	57-63 yrs	26-75 yrs	29-68 yrs	—	50-73 yrs	—	26-75 yrs
Gender							
Female	1	2	0	0	1	0	4 (26.7%)
Male	1	5	3	0	2	0	11 (73.3%)
Hospitalized							
Yes	0	7	3	0	3	0	13 (86.7%)
No	0	0	0	0	0	0	0 (0.0%)
Unknown	2	0	0	0	0	0	2 (13.3%)
Median no. of days hospitalized	—	9 days	9.5 days	—	—	—	9.0 days
Range of no. of days hospitalized	—	9 days	7-12 days	—	—	—	7-12 days
Outbreak status							
Outbreak/ cluster related	0	0	0	0	0	0	0 (0.0%)

Figure 23: Age Distribution of Cases of Legionellosis (N=15), Wyoming, 2003-2008

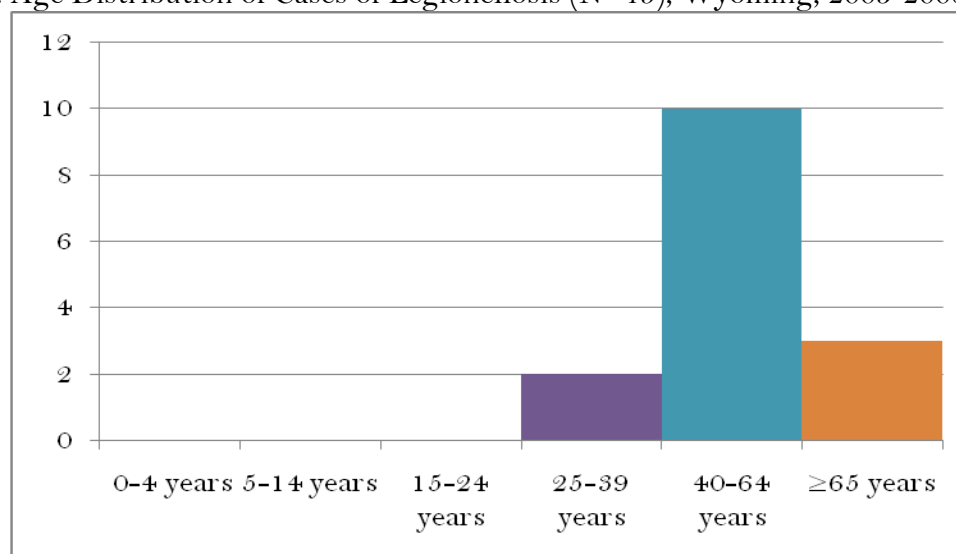


Table 42: Crude and Age-adjusted Incidence Rates of Legionellosis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	0	0.00	0.00	—
Big Horn	0	0.0	0.0	—
Campbell	1	0.40	0.44	0.81 (-0.78-2.40)
Carbon	1	1.11	1.00	2.04 (-1.96-6.03)
Converse	0	0.00	0.00	—
Crook	0	0.00	0.00	—
Fremont	1	0.46	0.52	1.06 (-1.02-3.15)
Goshen	1	1.38	1.37	2.80 (-2.69-8.30)
Hot Springs	0	0.00	0.00	—
Johnson	0	0.00	0.00	—
Laramie	1	0.20	0.17	0.36 (-0.34-1.06)
Lincoln	0	0.00	0.00	—
Natrona	5	1.21	1.21	2.46 (0.30-4.62)
Niobrara	0	0.00	0.00	—
Park	1	0.63	0.59	1.20 (-1.15-3.55)
Platte	0	0.00	0.00	—
Sheridan	0	0.00	0.00	—
Sublette	0	0.00	0.00	—
Sweetwater	2	0.89	0.88	1.79 (-0.69-4.27)
Teton	0	0.00	0.00	—
Uinta	1	0.85	1.29	2.63 (-2.52-7.78)
Washakie	0	0.00	0.00	—
Weston	1	2.2	1.80	3.67 (-3.52-10.86)
Total	15	0.49	0.47	0.53 (0.26-0.80)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 0.88 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Outbreaks of Legionellosis, 2003-2008

The Wyoming Department of Health did not investigate any outbreaks of legionellosis in 2003-2008.

Leptospirosis

Case definition

- Confirmed – a clinically compatible case that is laboratory confirmed by one of the following methods:
 - Isolation of *Leptospira* from a clinical specimen, or
 - Fourfold or greater increase in *Leptospira* agglutination titer between acute- and convalescent-phase serum specimens obtained greater than or equal to 2 weeks apart and studied at the same laboratory, or
 - Demonstration of *Leptospira* in a clinical specimen by immunofluorescence
- Probable - a clinically compatible case with supportive serologic findings (i.e., a *Leptospira* agglutination titer of greater than or equal to 200 in one or more serum specimens)

**This condition is no longer nationally notifiable, but it is reportable in the State of Wyoming.*

Summary

From 2003–2008, no cases of leptospirosis were reported to the WDH Infectious Disease Epidemiology Program (0.00 cases per 100,000 per year). The incidence of leptospirosis in Wyoming was statistically equivalent to the estimated US incidence (0.06 cases per 100,000 per year). (SIR: incalculable).

Outbreaks of Leptospirosis

The WDH Infectious Disease Epidemiology Program did not investigate any outbreaks of leptospirosis in 2003 through 2008.

Listeriosis

Case definition

- Confirmed: A clinically compatible case that is laboratory-confirmed by one of the following methods:
 - Isolation of *L. monocytogenes* from a normally sterile site (e.g., blood or cerebrospinal fluid [CSF] or, less commonly, joint, pleural, or pericardial fluid)
 - In the setting of miscarriage or stillbirth, isolation of *L. monocytogenes* from placental or fetal tissue

Summary

From 2003-2008, three cases of listeriosis were reported to the WDH Infectious Disease Epidemiology Program (0.10 cases per 100,000 per year), all of which were laboratory-confirmed via culture. The incidence of listeriosis in Wyoming was statistically less than the estimated US incidence (0.26 cases per 100,000 per year) based on CDC Nationally Notifiable Disease Surveillance System (SIR: 0.36, 95%CI: -0.05-0.76). The median age of cases of listeriosis was 67 years (range: 53-68 years). Persons aged 65 years or older had the highest age-specific incidence rate (0.27 cases per 100,000 per year). Cases were more likely to be male (67.7%) than female (33.3%). A definitive source of infection could not be identified for all cases. None of the cases reported working in a sensitive occupation like food-handling, healthcare or childcare. Uinta County reported the highest age-adjusted incidence rate (2.13 cases per 100,000 per year), which was twenty-one times greater than the expected statewide incidence rate (0.10 cases per 100,000 per year). However, that difference was not statistically significant due to the small number of cases reported. Albany and Uinta Counties are the only counties in Wyoming to report cases of listeriosis during the time period of interest.

Table 43: Occurrence of Listeriosis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	0	0	0	0	1	2	3
Total	0	0	0	0	1	2	3

Figure 24: Occurrence of Listeriosis by Year Reported (N=3), Wyoming, 2003-2008

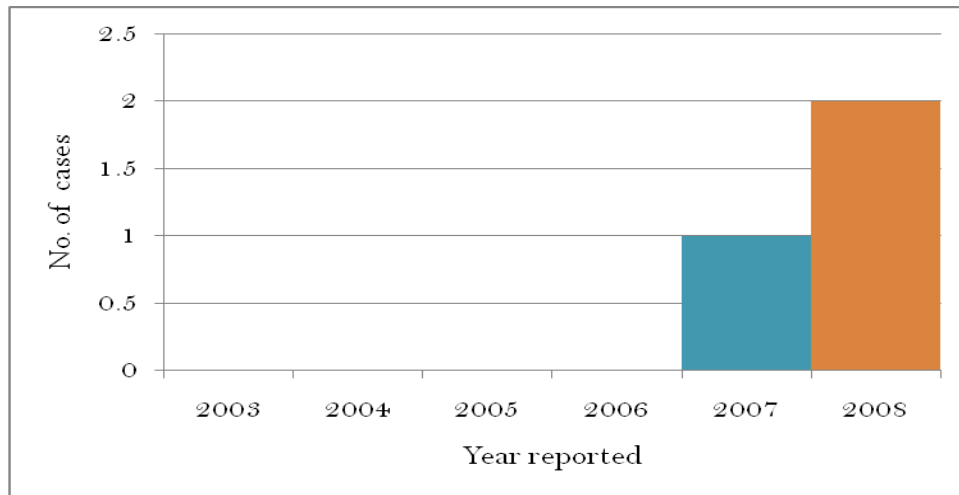


Figure 25: Incidence of Listeriosis by Month Reported (N=3), Wyoming, 2003-2008

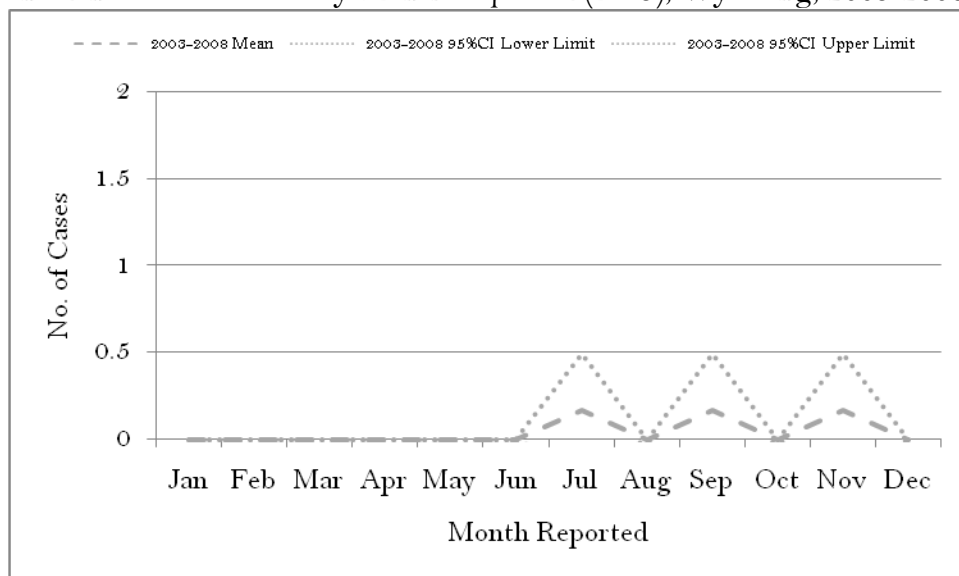


Table 44: Demographics of Case Patients with Listeriosis (N=3), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	0	0	0	0	0	0	0 (0.0%)
5-14 years	0	0	0	0	0	0	0 (0.0%)
15-24 years	0	0	0	0	0	0	0 (0.0%)
25-39 years	0	0	0	0	0	0	0 (0.0%)
40-64 years	0	0	0	0	0	1	1 (33.3%)
≥65 years	0	0	0	0	1	1	2 (67.7%)
Unknown	0	0	0	0	0	0	0 (0.0%)
Median age	—	—	—	—	68 yrs	60 yrs	67 yrs
Age range:	—	—	—	—	68 yrs	53-67	63-68 yrs

yrs							
Gender							
Female	0	0	0	0	1	0	1 (33.3%)
Male	0	0	0	0	0	2	2 (67.7%)
Hospitalized							
Yes	0	0	0	0	1	2	3 (100.0%)
No	0	0	0	0	0	0	0 (0.0%)
Unknown	0	0	0	0	0	0	0 (0.0%)
Median no. of days hospitalized	—	—	—	—	9 days	—	9 days
Range of no. of days hospitalized	—	—	—	—	9 days	—	9 days
Outbreak status							
Outbreak/ cluster related	0	0	0	0	0	0	0 (0.0%)

Figure 26: Age Distribution of Cases of Listeriosis (N=3), Wyoming, 2003-2008

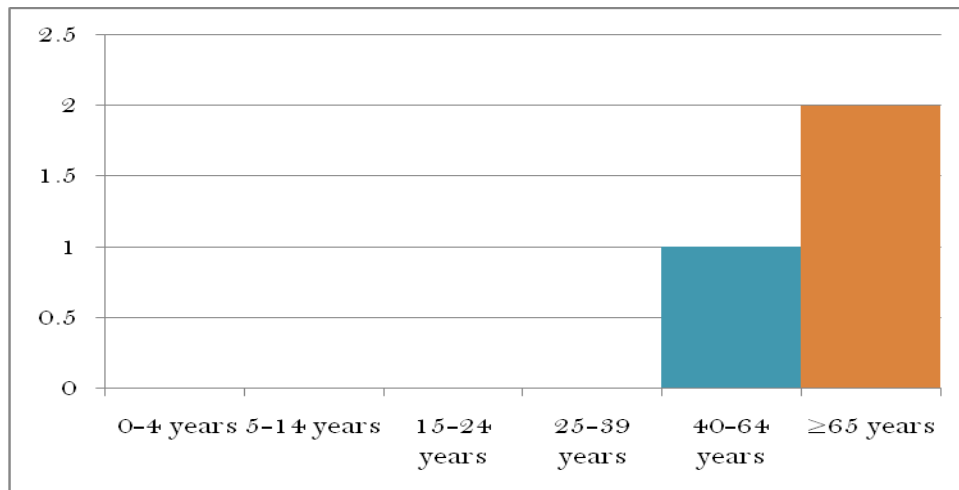


Table 45: Crude and Age-adjusted Incidence of Listeriosis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	1	0.51	0.74	7.44 (-7.14-22.03)
Big Horn	0	0.00	0.00	—
Campbell	0	0.00	0.00	—
Carbon	0	0.00	0.00	—
Converse	0	0.00	0.00	—
Crook	0	0.00	0.00	—
Fremont	0	0.00	0.00	—
Goshen	0	0.00	0.00	—

Hot Springs	0	0.00	0.00	—
Johnson	0	0.00	0.00	—
Laramie	0	0.00	0.00	—
Lincoln	0	0.00	0.00	—
Natrona	0	0.00	0.00	—
Niobrara	0	0.00	0.00	—
Park	0	0.00	0.00	—
Platte	0	0.00	0.00	—
Sheridan	0	0.00	0.00	—
Sublette	0	0.00	0.00	—
Sweetwater	0	0.00	0.00	—
Teton	0	0.00	0.00	—
Uinta	2	1.70	2.13	21.27 (-8.21-50.76)
Washakie	0	0.00	0.00	—
Weston	0	0.00	0.00	—
Total	3	0.10	0.09	0.38 (-0.05-0.76)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 0.26 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 46: Clinical Characteristics among Cases of Listeriosis, Wyoming, 2003–2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	0	0	0	0	1	0	1 (33.3%)
No	0	0	0	0	0	1	1 (33.3%)
Unknown	0	0	0	0	0	1	1 (33.3%)
Specimen source							
Stool	0	0	0	0	0	1	1 (33.3%)
Blood	0	0	0	0	1	1	2 (67.7%)
Bacterial isolate was confirmed at WPHL*							
Yes	0	0	0	0	1	2	3 (100.0%)
No	0	0	0	0	0	0	0 (0.0%)
Species of Listeria							
<i>L. monocytogenes</i>	0	0	0	0	1	2	3 (100.0%)
Received antibiotic							
Yes	0	0	0	0	1	2	3 (100.0%)
No	0	0	0	0	0	0	0 (0.0%)
Unknown	0	0	0	0	0	0	0 (0.0%)

* Wyoming state statute requires clinical laboratories to send confirmed *Listeria* isolates to the Wyoming Public Health Laboratory for confirmation and pulsed-field gel electrophoresis analysis.

Outbreaks of Listeriosis, 2003–2008

The Wyoming Department of Health did not investigate any outbreak of listeriosis in 2003–2008.

Salmonellosis

Case definition

- Confirmed – a case that is laboratory confirmed by isolation of *Salmonella* bacteria from any clinical specimen
- Probable – a clinically compatible case that is epidemiologically-linked to a laboratory-confirmed case

Summary

From 2003-2008, 425 cases of salmonellosis were reported to the WDH Infectious Disease Epidemiology Program (13.97 cases per 100,000 per year). Of the cases reported, 394 (92.7%) were laboratory-confirmed and 31 (7.3%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of salmonellosis in Wyoming was statistically equivalent to the estimated US incidence (14.0 cases per 100,000 per year) based on CDC FoodNet sites (SIR: 0.98, 95%CI: 0.89-1.08). The median age of cases of salmonellosis was 27 years (range: 0-92 years). Children aged 0-4 years had the highest age-specific incidence rate (39.07 cases per 100,000 per year), which was approximately three times higher than the incidence rate for the general population. Cases were more likely to be female (52.0%) than male (48.0%). While a definitive source of the infection could not be determined in nearly 52.0% of all cases, consuming food from a commercial venue (such as a restaurant) and contact with animals (especially reptiles) are common sources of *Salmonella* infection in Wyoming. Direct or indirect contact with reptiles was the leading source of *Salmonella* infection in children 5 years of age or less (18.4%).

All Wyoming counties reported at least one case of salmonellosis in 2003-2008. Lincoln County reported the highest age-adjusted incidence rate (30.21 cases per 100,000 per year), which was more than double the expected statewide incidence rate (13.97 cases per 100,000 per year). In addition to Lincoln County, Park County (25.05 cases per 100,000 per year) also had an age-adjusted incidence rate that was statistically greater than the statewide incidence rate. Albany County (8.10 cases per 100,000 per year), Goshen County (5.97 cases per 100,000 per year), Johnson County (5.25 cases per 100,000 per year), Laramie County (9.02 cases per 100,000 per year), and Washakie County (3.02 cases per 100,000 per year) had incidence rates that were statistically less than the statewide incidence rate. All other counties had age-adjusted incidence rates that were statistically equivalent to the statewide incidence rate.

Table 47: Occurrence of Salmonellosis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	78	55	70	44	73	74	394
Probable	0	0	16	3	5	7	31
Total	78	55	86	47	78	81	425

Figure 27: Occurrence of Salmonellosis by Year Reported, Wyoming, 2003-2008

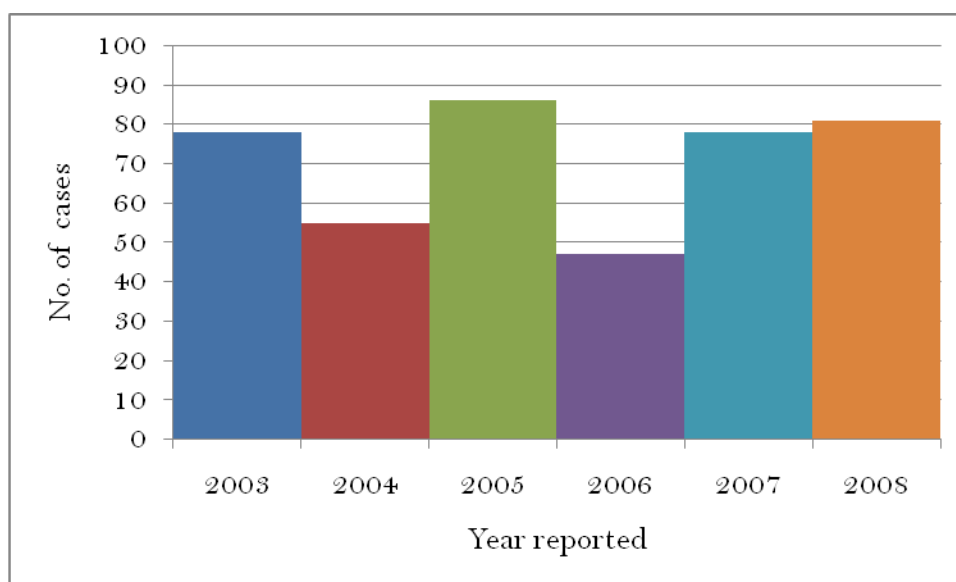


Figure 28: Incidence of Salmonellosis by Month Reported, Wyoming, 2003-2008

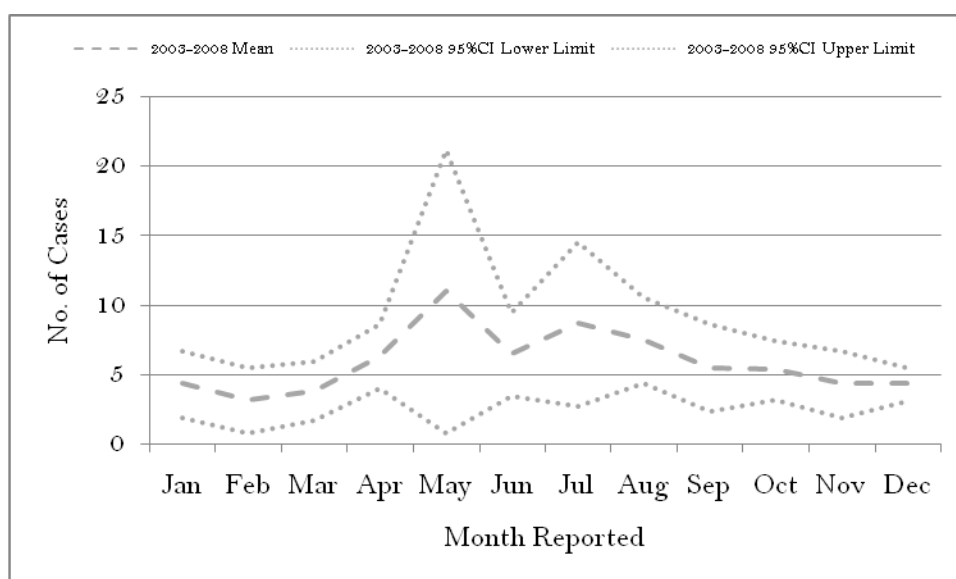
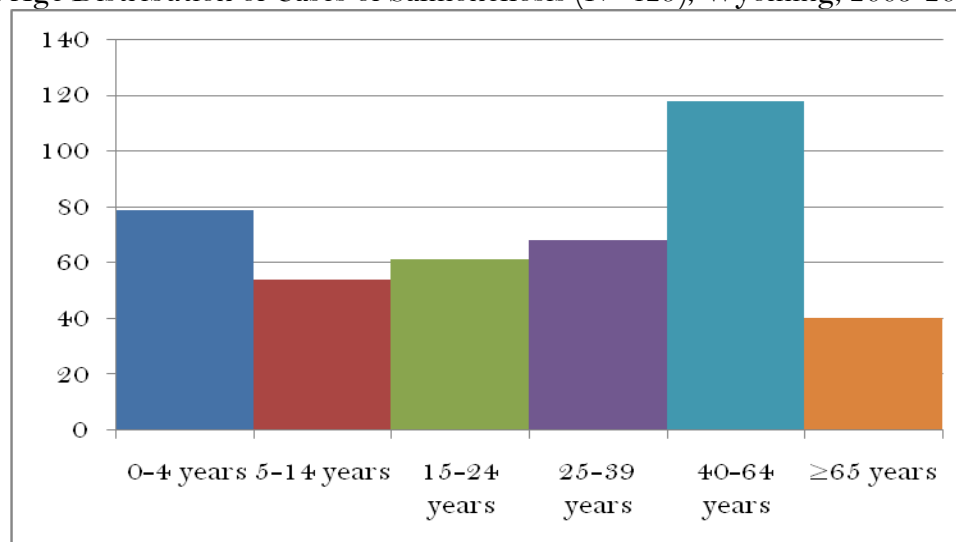


Table 48: Demographics of Case Patients with Salmonellosis (N=425), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	12	15	6	14	14	18	79 (18.8%)
5-14 years	11	5	14	6	11	7	54 (12.9%)
15-24 years	11	5	9	4	19	13	61 (14.5%)
25-39 years	22	5	9	9	14	9	68 (16.2%)
40-64 years	16	19	31	11	15	26	118 (28.1%)
≥65 years	6	6	12	3	5	8	40 (9.5%)
Unknown	0	0	5	0	0	0	5 (1.2%)
Median age	25.5 years	37 years	41 years	22 years	22.5 years	28 years	27 years
Age range:	0-88 years	0-92 years	0-83 years	0-82 years	0-81 years	0-88 years	0-92 years
Gender							
Female	40	25	48	28	40	40	221 (52.0%)
Male	38	30	38	19	38	41	204 (48.0%)
Hospitalized							
Yes	19	11	19	10	13	17	89 (20.9%)
No	56	40	62	35	62	63	318 (74.2%)
Unknown	3	4	5	2	3	1	18 (4.2%)
Median no. of days hospitalized	2.0 days	2.0 days	4.0 days	3.0 days	4.5 days	2.0 days	3.0 days
Range of no. of days hospitalized	1-7 days	1-3 days	2-10 days	1-7 days	1-10 days	1-14 days	0-14 days
Outbreak status							
Outbreak/ cluster related	36	3	25	2	36	14	116 (27.3%)

Figure 29: Age Distribution of Cases of Salmonellosis (N=425), Wyoming, 2003-2008



*Five cases in 2005 had an unknown age.

Table 49: Crude and Age-adjusted Incidence of Salmonellosis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	16	8.20	8.10	0.58 (0.30-0.86)§
Big Horn	9	13.45	12.23	0.88 (0.30-1.45)
Campbell	27	11.97	12.36	0.88 (0.55-1.22)
Carbon	7	7.77	8.33	0.60 (0.15-1.04)
Converse	14	18.71	18.23	1.31 (0.62-1.99)
Crook	6	16.52	15.05	1.08 (0.22-1.94)
Fremont	34	15.50	15.75	1.13 (0.75-1.31)
Goshen	4	5.52	5.97	0.43 (0.01-0.85)§
Hot Springs	2	7.33	7.21	0.52 (-0.20-1.23)
Johnson	3	6.52	5.25	0.38 (-0.05-0.80)§
Laramie	47	9.19	9.02	0.65 (0.46-0.83)§
Lincoln	27	29.61	30.21	2.16 (1.35-2.98)§
Natrona	59	14.29	14.28	1.02 (0.76-1.28)
Niobrara	3	22.40	15.70	1.12 (-0.15-2.40)
Park	37	23.33	25.05	1.79 (1.22-2.37)§
Platte	7	13.73	15.34	1.10 (0.28-1.91)
Sheridan	34	20.75	21.89	1.57 (1.04-2.09)§
Sublette	4	9.57	9.65	0.69 (0.01-1.37)
Sweetwater	39	17.29	17.75	1.27 (0.87-1.67)
Teton	16	13.73	14.42	1.03 (0.53-1.54)
Uinta	14	11.89	11.72	0.84 (0.40-1.28)
Washakie	2	4.29	3.02	0.22 (-0.08-0.52)§
Weston	9	22.72	27.39	1.96 (0.68-3.24)
Total	425	13.97	13.77	0.98 (0.89-1.08)†

*Wyoming state population used as "standard" population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 14.00 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 50: Clinical Characteristics among Cases of Salmonellosis, Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	71	44	75	40	65	68	363 (85.4%)
No	1	1	2	1	5	4	14 (3.3%)
Unknown	6	10	9	6	8	9	48 (11.3%)
Specimen source							
Stool	76	46	63	42	68	65	360 (91.1%)
Blood	0	1	3	0	1	5	10 (2.5%)
Urine	2	6	4	1	2	4	19 (4.8%)
Other	0	2	1	0	1	0	4 (0.9%)
Unknown	0	0	15	3	5	7	30 (7.1%)
Bacterial isolate was confirmed at WPHL*							

Yes	73	33	59	42	67	69	343 (80.7%)
No	5	22	27	5	11	12	82 (19.3%)
Received antibiotic							
Yes	20	13	33	23	23	35	147 (34.6%)
No	13	10	26	7	25	21	102 (24.0%)
Unknown	45	32	27	17	30	25	176 (41.4%)

* Wyoming state statute requires clinical laboratories to send confirmed *Salmonella* isolates to the Wyoming Public Health Laboratory for confirmation, subtyping and pulsed-field gel electrophoresis analysis.

Table 51: Reported *Salmonella* Serotypes (N=333) by Year, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Typhimurium	9	11	9	5	12	14	60 (18.0%)
Heidelberg	34	1	3	8	2	6	54 (16.2%)
Enteritidis	6	7	14	10	5	9	51 (15.3%)
Typhimurium var O5 (Copenhagen)	1	0	3	3	8	5	20 (6.0%)
Muenster	0	0	0	1	16	0	17 (5.1%)
Newport	3	2	5	1	2	4	17 (5.1%)
14,[5],12:i-	0	0	3	1	4	5	13 (3.9%)
Oranienberg	1	1	3	0	1	2	8 (2.4%)
Thompson	3	0	2	0	2	1	8 (2.4%)
Montevideo	1	0	0	3	2	0	6 (1.8%)
Saintpaul	4	2	0	0	0	0	6 (1.8%)
Infantis	1	0	0	0	1	3	5 (1.5%)
Javiana	1	1	1	1	1	0	5 (1.5%)
Paratyphi B	0	0	3	2	0	0	5 (1.5%)
Hadar	0	0	2	0	0	2	4 (1.2%)
Litchfield	0	0	0	0	0	4	4 (1.2%)
Tennessee	0	0	2	0	2	0	4 (1.2%)
Braenderup	0	0	1	0	0	2	3 (0.9%)
Muechen	0	0	2	0	0	1	3 (0.9%)
Poona	0	0	2	0	0	1	3 (0.9%)
Agona	0	0	0	0	0	2	2 (0.6%)
Dublin	0	1	0	0	0	1	2 (0.6%)
Rubislaw	2	0	0	0	0	0	2 (0.6%)
Sandiego	1	0	0	0	1	0	2 (0.6%)
Stanley	1	0	1	0	0	0	2 (0.6%)
50:gz51:-	0	0	0	0	0	1	1 (0.3%)
Agbeni	0	0	0	0	0	1	1 (0.3%)
Anatum	0	0	0	1	0	0	1 (0.3%)
Multiple	0	0	0	0	1	0	1 (0.3%)
Baildon	0	0	0	0	0	1	1 (0.3%)
Blijdorp	0	0	0	0	1	0	1 (0.3%)
Bobo	0	0	1	0	0	0	1 (0.3%)
Chester	1	0	0	0	0	0	1 (0.3%)
Coeln	1	0	0	0	0	0	1 (0.3%)
Concord	0	0	0	0	0	1	1 (0.3%)
Cotham	0	0	0	0	0	1	1 (0.3%)
Derby	1	0	0	0	0	0	1 (0.3%)
Dusseldorf	0	0	0	1	0	0	1 (0.3%)

Freetown	0	0	1	0	0	0	1 (0.3%)
Hvittingfoss	0	1	0	0	0	0	1 (0.3%)
IIIb:50:z:z52	0	0	0	0	1	0	1 (0.3%)
IV44:z4,z23:-	1	0	0	0	1	0	1 (0.3%)
IIIz48:g,z51:-	0	0	1	0	0	0	1 (0.3%)
Kibusi	0	0	0	0	1	0	1 (0.3%)
Mbandaka	1	0	0	0	0	0	1 (0.3%)
Monschau	0	0	0	0	1	0	1 (0.3%)
Paratyphi, unspecified	0	0	0	0	1	0	1 (0.3%)
Paratyphi A	0	0	0	1	0	0	1 (0.3%)
Reading	0	0	0	0	0	1	1 (0.3%)
Seftenberg	1	0	0	0	0	0	1 (0.3%)
Sundvall	1	0	0	0	0	0	1 (0.3%)
Uganda	0	0	1	0	0	0	1 (0.3%)

* Wyoming state statute requires clinical laboratories to send confirmed *Salmonella* isolates to the Wyoming Public Health Laboratory for confirmation, subtyping and pulsed-field gel electrophoresis analysis.

Table 52: Most Likely Source of Infection among Cases of Salmonellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Source not evident	23	40	47	25	38	48	221 (52.0%)
Food source at restaurant or other food venue	34	1	20	0	19	3	77 (18.1%)
Animal source	17	8	10	14	12	15	76 (17.9%)
Foreign travel	3	4	3	7	4	5	26 (6.1%)
Food source at home	1	0	6	0	5	5	17 (4.0%)
Daycare transmission	0	2	0	1	0	0	3 (0.7%)
Person-to-person transmission	0	0	0	0	0	2	2 (0.5%)
Multiple exposures	0	0	0	0	0	1	1 (0.2%)
Environmental contamination	0	0	0	0	0	1	1 (0.2%)
Occupational exposure	0	0	0	0	0	1	1 (0.2%)

Likely exposures are determined by making a "best guess" by trained epidemiologists based on the case patient's exposure history and should not be viewed as a definitive source of infection.

Table 53: Frequency of Certain Animal Exposures Reported by Cases of Salmonellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Contact with dog	18	10	25	20	33	26	132 (31.1%)
Contact with cattle	4	3	3	1	5	3	19 (4.5%)
Contact with cat	14	4	13	13	28	17	89 (20.9%)
Contact with horse	5	2	1	3	9	2	22 (5.2%)
Contact with bird	5	0	1	7	4	5	22 (5.2%)
Contact with sheep	1	1	0	0	1	0	3 (0.7%)
Contact with pig	0	0	0	2	1	1	4 (0.9%)
Contact with goat	2	0	0	3	2	1	8 (1.9%)
Contact with rodent	5	2	3	3	1	2	16 (3.8%)
Contact with reptile	9	6	7	7	9	13	51 (12.0%)

Contact with amphibian	2	0	1	2	1	2	8 (1.9%)
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Percentages can add up to more than 100% because case patients can report exposure to more than one of these types of animals.

Table 54: Frequency of Other Exposures among Cases of Salmonellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Ate at any restaurant	57	20	53	27	44	47	248 (58.4%)
Ate at any fast food restaurant	13	9	18	15	38	22	15 (27.1%)
Consumed water from a private well	6	7	15	12	11	6	57 (13.4%)
Swam in treated water venue	5	1	4	3	3	5	21 (4.9%)
Swam in untreated water venue	6	0	4	8	1	8	27 (6.4%)
Attended daycare	5	10	3	2	7	4	31 (7.3%)
Live with daycare attendee	2	1	0	2	6	4	15 (3.5%)
Out of state travel	13	9	11	8	9	14	64 (15.1%)
International travel	3	4	3	7	5	5	27 (6.4%)

Percentages can add up to more than 100% because case patients can report more than one of these exposures.

Table 55: Frequency of Reported High-Risk Occupations among Cases of Salmonellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Food-handling employee	0	1	2	1	7	3	14 (3.3%)
Healthcare worker with direct patient contact	4	1	1	2	4	2	14 (3.3%)
Daycare worker	0	0	0	1	0	0	1 (0.2%)

Public health guidelines call for the exclusion of these individuals from their high-risk occupational setting until the patient has provided two consecutively negative stool samples that were collected at least 24 hours apart and at least 72 hours after the cessation of antibiotic therapy.

Outbreaks of Salmonellosis, 2003-2008

Restaurant-Associated Salmonellosis, Park County, 2003

In May 2003, the WDH Infectious Disease Epidemiology Program investigated an outbreak of salmonellosis at a restaurant in Park County in collaboration with the Wyoming Department of Agriculture Consumer Health Services Division. A total of 65 cases of *Salmonella* serotype Heidelberg (39 laboratory-confirmed and 26 probable cases) were identified as linked to the restaurant. Epidemiologic and laboratory analyses indicate that canned mushrooms, contaminated through poor food-handling practices at the restaurant, were the likely vehicle of transmission although other food items may have been cross-contaminated. (Weidenbach, et al. *Restaurant-Associated Outbreak of Salmonella Serotype Heidelberg Linked to Improperly Handled Mushrooms, Wyoming, 2003*. Food Protection Trends 2006;26:150-152.)

Turtle-Associated Salmonellosis, Natrona County, 2004

In late summer of 2004, two human cases of salmonellosis were linked by pulsed-field gel electrophoresis (PFGE) to pet turtles in Wyoming. Baby turtles from both case patients were

obtained from a pet store in Casper that was illegally selling them. The FDA banned sale of baby turtles with a carapace of less than four inches in 1975 as they were linked to numerous cases of human salmonellosis. The turtles were confiscated and were relocated to Florida through an area herpetologist. Similar illegal sales of baby turtles and human cases of salmonellosis occurred in other states like Wisconsin and South Carolina. (CDC. *Salmonellosis Associated with Pet Turtles - Wisconsin and Wyoming, 2004*. MMWR 2005;54:223-226.)

Restaurant-Associated Outbreak of Salmonella Enteritidis; Sweetwater County, 2005

In June 2005, the WDH Infectious Disease Epidemiology Program was notified of a cluster of three laboratory-confirmed *Salmonella* infections in persons who had dined at a Chinese restaurant in Sweetwater County. Upon the identification of an additional five laboratory-confirmed cases, the restaurant was closed pending further investigation. The WDH Infectious Disease Epidemiology Program and Sweetwater County Environmental Health initiated an on-site investigation. A total of nine laboratory-confirmed cases and eleven probable cases were identified, including staff and patrons of the implicated restaurant. Eight isolates from laboratory-confirmed case patients were identical via pulsed-field gel electrophoresis (PFGE). The WDH Infectious Disease Epidemiology Program conducted a case-control study to identify risk factors for illness. A total of 19 ill and 26 well patrons/staff were interviewed. The case-control study revealed consumption of eggs and raw tomatoes as risk factors statistically associated with illness. Investigators identified cross-contamination in the restaurant's kitchens as the likely cause of the outbreak. The restaurant was given stringent guidelines for re-opening. The restaurant met these requirements, and re-opened. No additional cases were identified after the restaurant's re-opening.

Multistate Outbreak of Salmonella Montevideo Associated with Exposure to Young Poultry, 2006

A child from Sweetwater County was infected with *Salmonella* serotype Montevideo in April 2006 after having contact with chicks. The case patient's *Salmonella* isolate had an identical pulsed-field gel electrophoresis (PFGE) pattern to cases from other states identified to be related to an outbreak associated with contact with young poultry from a hatchery in New Mexico. The Wyoming case patient had contact with chicks purchased at a feed store in Casper. Public health officials were able to demonstrate that the Casper feed store purchased the young poultry from the implicated New Mexico hatchery. A total of 56 cases in 21 states were identified to be part of this multistate outbreak.

Multistate Cluster of Salmonella Enteritidis Related to Travel to Jamaica, 2006

In June 2006, the WDH Infectious Disease Epidemiology Program contacted a case patient with laboratory-confirmed *Salmonella* Enteritidis infection. Routine epidemiologic follow-up revealed that the case patient had recent travel to Jamaica. Other individuals in her household who had traveled to Jamaica also experienced a gastrointestinal illness. Two family members had gastrointestinal illness compatible with salmonellosis and were reported as probable cases. Three other family members reported mild gastrointestinal illness lasting approximately 24 hours. The case patient also reported that other family members who were Colorado residents who also traveled with them also developed gastroenteritis after returning from their vacation. The WDH Infectious Disease Epidemiology Program contacted the Centers for Disease Control and Prevention (CDC) to notify them of the travel-associated illness. CDC was able to identify additional cases in other states (MO, IA, and WI) with *Salmonella* Enteritidis infection after returning from Jamaica.

Multistate Outbreak of Salmonella Typhimurium Associated with Dead, Frozen Rodents, 2006

In July 2006, the WDH Infectious Disease Epidemiology Program identified a case of *Salmonella* serotype Typhimurium in Hot Springs County that was linked through laboratory evidence to a multistate outbreak associated with dead, frozen rodents. The Wyoming case patient had contact with dead frozen rodents that were purchased over the internet as food for her family's pet snake. Although *Salmonella* infections are frequently associated with pet reptiles, the multistate investigation revealed that the common source was the dead, frozen rodents from one breeder/internet retailer located in Texas. (Fuller, et al. *A Multi-State Salmonella Typhimurium Outbreak Associated with Frozen Vacuum-Packed Rodents Used to Feed Snakes*. *Zoonoses and Public Health*. 2008;8-10:481-482.)

Multistate Outbreak of Salmonella Tennessee Associated with Contaminated Peanut Butter, 2007

From November 2006-February 2007, public health officials from CDC and state health departments conducted an outbreak investigation of *Salmonella* serotype Tennessee associated with two brands of peanut butter. Two cases of *Salmonella* Tennessee in Wyoming were reported to the WDH Infectious Disease Epidemiology Program. In March 2007, the WDH Infectious Disease Epidemiology Program received a report from the Casper-Natrona County Health Department (CNCHD) regarding an adult male Natrona County resident with gastrointestinal illness after consuming the implicated peanut butter. CNCHD facilitated *Salmonella* stool testing for the case patient through WPHL, and the case was confirmed with *Salmonella* Tennessee with one of the three PFGE patterns associated with the multistate outbreak. In June 2007, the WDH Infectious Disease Epidemiology Program received a laboratory report confirming *Salmonella* Tennessee infection in an adult male Laramie County resident. Upon routine case follow-up, the Laramie County case did not recall consuming the implicated peanut butter. A total of 714 outbreak-related cases were identified in 48 states with onset dates ranging from August 1, 2006 through July 19, 2007. The median age of case patients was 53 years (range: 1-95 years), and 73% of cases were female. At least 20% of cases were hospitalized, and no deaths were reported. The outbreak was linked to one plant that produces several commercial brands of peanut butter. (CDC. *Multistate Outbreak of Salmonella Serotype Tennessee Infections Associated with Peanut Butter—United States, 2006-2007*. *MMWR* 2007;56(21):521-524).

Restaurant-Associated Outbreak of Salmonellosis, Lincoln County, 2007

An epidemiologic investigation began in mid-April when the WDH Infectious Disease Epidemiology Program learned of 3 cases of salmonellosis in Lincoln County. Initial case follow-up linked all 3 cases to a common restaurant in Afton, WY. The WDH Infectious Disease Epidemiology Program and the Wyoming Department of Agriculture-Consumer Health Services (CHS) initiated an investigation of the restaurant. Restaurant employees were required to submit stool samples for testing and results revealed that seven of the 25 employees tested, were positive for the *Salmonella* bacterium. All employees who tested positive were excluded from work until a negative enteric screen resulted. All *Salmonella* cases, both employees of the restaurant and members of the community were identified as *Salmonella* Munester and were 100% indistinguishable by PFGE analysis. In total, 14 cases of *Salmonella* Muenster, including the seven employees, were reported from the beginning of April to early

May 2007. The duration of illness ranged from 1-30 days with a median of 7 days. Two of the cases required hospitalization. A case-control study revealed an increased risk of illness following the consumption of ham or American cheese, most likely as a result of contamination by infected food handlers.

Multistate Outbreak of Salmonella Montevideo Associated with New Mexico Hatchery, 2007

The multistate outbreak of *Salmonella* Montevideo associated with young poultry from one New Mexico hatchery was ongoing from 2006-2007. In May 2007, the WDH Infectious Disease Epidemiology Program identified one Wyoming resident, an infant from Fremont County, with an identical PFGE pattern to the ongoing multistate outbreak. The Wyoming case patient had indirect contact with chicks that had been purchased from a local feed store. Product tracebacks indicated that the local feed store had purchased the chicks from the implicated hatchery in New Mexico, which had been under investigation by the CDC since early 2006.

Multistate Outbreak of Salmonella Enteritidis Associated with River Raft Trip in Idaho, 2007

In August 2007, the WDH Infectious Disease Epidemiology Program was notified of an outbreak of salmonellosis associated with an Oregon-based river rafting company and a river raft trip that embarked from Salmon, Idaho. Two Wyoming residents participated in the implicated rafting trip. The WDH Infectious Disease Epidemiology Program contacted the Wyoming residents to determine illness status and to acquire exposure information. One of the Wyoming residents did experience gastrointestinal symptoms that began during the rafting trip. A total of 9 guides and 20 patrons embarked on the trip, and 10 individuals met the investigators' case definition for gastroenteritis. One person was confirmed with *Salmonella* serotype Enteritidis. Unsafe food-handling and water-handling practices by rafting guides were suspected to be the cause of the outbreak.

Multistate Outbreak of Salmonella Typhimurium I4, [5], 12:I Associated with Poultry Pot Pies, 2007

From June through September 2007, public health officials from CDC and state health departments investigated cases of *Salmonella* serotype I4,5,12:i:-* sharing a common PFGE pattern. A total of 401 cases in 41 states were identified. Consuming commercially-prepared poultry pot pies produced by one company was shown to be statistically associated with illness. On October 11, 2007, the company producing the pot pies released a voluntary recall of pot pies potentially associated with the outbreak, which were sold under at least nine different brand names. The WDH Infectious Disease Epidemiology Program identified 3 Wyoming residents with a laboratory association with this outbreak. Only one of the three Wyoming case patients recalled consuming the implicated potpies. (CDC. *Multistate Outbreak of Salmonella Infections Associated with Frozen Pot Pies – United States, 2007*. MMWR 2008;57:1277-1280).

Outbreak of Salmonella Typhimurium Associated with a High School Basketball Team; Sheridan County, 2007

In December 2007, a confirmed case of *Salmonella* Typhimurium was interviewed for routine epidemiologic follow-up by the WDH Infectious Disease Epidemiology Program. The case patient reported three other persons who were ill after traveling to Wheatland and Chugwater for a boys and girls high school basketball tournament. Both the boys' and girls' high school basketball teams traveled to Wheatland/Chugwater in early December. The teams had dinner

at a Wheatland restaurant and stayed in a Wheatland motel for one night. The teams ate breakfast and lunch at other local restaurants. The WDH Infectious Disease Epidemiology Program encouraged stool testing of the three other ill persons, and two subsequently tested positive for *Salmonella* Typhimurium at WPHL. The WDH Infectious Disease Epidemiology Program gathered three day food histories for the four case patients. The only common exposure among case patients was a chicken dish at the Wheatland restaurant where the teams ate dinner. A consumer health specialist visited the implicated restaurant and conducted a full inspection. The WDH Infectious Disease Epidemiology Program conducted active surveillance for additional cases, and none were identified. Three adolescents from Platte County who also attended the basketball tournament in Chugwater also reported gastrointestinal illness. However, these possible case patients did not submit stool specimens even after strong encouragement. The WDH Infectious Disease Epidemiology Program was unable to confirm the source of the outbreak and was not able to evaluate whether or not the case patients from Platte County were truly associated with the Sheridan County case patients.

Outbreak of Salmonella Litchfield Cases, Campbell County, 2008

In March 2008, a total of four laboratory-confirmed cases of *Salmonella* Litchfield had been identified in Campbell County. Routine case follow-up revealed a local Mexican restaurant as a potential common source for 3 of the 4 cases. Additionally, the WDH Infectious Disease Epidemiology Program received a food complaint against the same restaurant in mid-February. The WDH Infectious Disease Epidemiology Program and Wyoming Department of Agriculture Consumer Health Services Division initiated an outbreak investigation. A restaurant inspection revealed two critical food safety violations, both violations in temperature control of food. Investigators completed interviews with all employees, and all employees were required to submit stool specimens for testing at the Wyoming Public Health Laboratory. No food-handling staff were found to be positive with *Salmonella*. The WDH Infectious Disease Epidemiology Program did not identify a food vehicle in the restaurant and did not identify any other cases of *Salmonella* Litchfield after the outbreak investigation began.

Multistate Outbreak of Salmonella Hadar Associated with Turkey Consumption, 2008

In August 2008, the WDH Infectious Disease Epidemiology Program was notified by the Minnesota Department of Health regarding a national outbreak of *Salmonella* Hadar with a distinct PFGE pattern associated with turkey consumption. Two Wyoming residents were found to have a PFGE match to the outbreak: 1) an adolescent Sheridan County resident and 2) an adult Uinta County resident. A turkey-specific questionnaire was administered to the Uinta County case. The Sheridan County case was not re-interviewed using the turkey-specific questionnaire due to recall bias (too much time had elapsed since his diagnosis and first interview and when WDH was notified of the outbreak). Follow-up with the Uinta County case revealed multiple turkey exposures while the patient was traveling to visit family in Utah. The patient's father, a Utah resident, was also a confirmed *Salmonella* Hadar case with an identical PFGE pattern. A total of 65 cases in the following states have been identified: Arkansas, Arizona, California, Colorado, Georgia, Hawaii, Iowa, Indiana, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New Mexico, New York, Pennsylvania, Texas, Utah, Virginia, Vermont, Wisconsin, and Wyoming. The precise source of the outbreak has not yet been identified.

Multistate Outbreak of Salmonella Typhimurium I4,[5],12:i:- Associated with Frozen, Stuffed Chicken Products, 2008

The Minnesota Department of Health identified an outbreak of *Salmonella* Typhimurium I4,[5],12:i:- associated with frozen, stuffed chicken products with a distinct, two-enzyme PFGE pattern (JPXX01.0642 and JPXA26.0331). A total of 32 isolates from 12 states had human isolates that match the outbreak strains. One case of salmonellosis from WY has a molecular match to this outbreak – an adult from Natrona County with onset in July. Follow-up did not reveal an epidemiologic link to this outbreak.

Multistate Outbreak of Salmonella Newport Associated with Ground Beef Consumption, 2008

The Colorado Department of Public Health and Environment identified an outbreak of *Salmonella* Newport where six Colorado cases and one Wyoming case had a two-enzyme PFGE match. Case follow-up revealed that most cases reported exposure to a specific type of ground beef distributed in the region. An adult from Albany County matched this outbreak and reports illness onset in mid-August. The Wyoming case patient possibly consumed the implicated beef at home.

Multistate Outbreak of Salmonella Typhimurium Associated with Peanut Butter, 2008

In December 2008, the WDH Infectious Disease Epidemiology Program identified two cases of salmonellosis in Laramie County. The cases were two children from the same household. PFGE analyses showed that the two cases were associated with a large national outbreak of *Salmonella* serotype Typhimurium associated with peanut butter and peanut butter-containing products. Public health officials from CDC and state health departments investigated the outbreak. A total of 529 individuals from 43 states and one person from Canada had been reported with the outbreak strain. Illness onset dates among confirmed cases ranged from September 1, 2008 to January 16, 2009. A total of 116 case patients were hospitalized. The WDH Infectious Disease Epidemiology Program identified only those two children in Wyoming with the outbreak strain. The implicated peanut butter products were all produced at one plant and were sold under a multitude of brand name products. (CDC. *Multistate Outbreak of Salmonella Infections Associated with Peanut Butter and Peanut Butter-Containing Products – United States, 2008-2009*. MMWR 2009;58).

Shigellosis

Case definition

- Confirmed – a case that is laboratory confirmed by isolation of *Shigella* bacteria from any clinical specimen
- Probable – a clinically compatible case that is epidemiologically-linked to a laboratory-confirmed case

Summary

From 2003-2008, 148 cases of shigellosis were reported to the WDH Infectious Disease Epidemiology Program (4.86 cases per 100,000 per year). Of the cases reported, 141 (95.3%) were laboratory-confirmed and seven (4.7%) were probable cases (epidemiologically-linked to a confirmed case). The incidence of shigellosis in Wyoming was statistically less than the estimated US incidence (6.59 cases per 100,000 per year) based on CDC FoodNet sites (SIR: 0.73, 95%CI: 0.61-0.85). The median age of cases of shigellosis was eight years (range: 0-89 years). Children aged 0-4 years had the highest age-specific incidence rate (20.28 cases per 100,000 per year), which was approximately four times higher than the incidence rate for the general population. Cases were more likely to be female (54.7%) than male (45.3%). Person-to-person transmission was the most likely source for over two-thirds of case patients (67.6%). No evidence source of illness was found for 23.6% of case patients. Other notable sources of shigellosis were foreign travel and daycare transmission. Many cases were associated with a large outbreak occurring in 2006-2007 in Fremont County and on the Wind River Indian Reservation.

Fremont County reported the highest age-adjusted incidence rate (51.63 cases per 100,000 per year), which was more than ten times higher than the expected statewide incidence rate (4.86 cases per 100,000 per year) and was the only county to have an age-adjusted incidence rate that was higher than the statewide rate. No cases were reported in Albany, Campbell, Crook, Goshen, Hot Springs, Johnson, Lincoln, Niobrara, Park, Platte, Sublette, Uinta, and Weston Counties. Laramie County (0.78 cases per 100,000 per year), Natrona County (2.18 cases per 100,000 per year), Sheridan County (0.61 cases per 100,000 per year), Sweetwater (2.22 cases per 100,000 per year), and Teton County (1.72 cases per 100,000 per year) reported cases but their age-adjusted incidence rates were statistically less than the statewide incidence rate. All other counties had age-adjusted incidence rates that were statistically equivalent to the statewide incidence rate.

Table 56: Occurrence of Shigellosis by Year Reported and by Status, Wyoming, 2003-2008

Status	2003	2004	2005	2006	2007	2008	Total
Confirmed	8	7	5	85	28	8	141 (95.3%)
Probable	0	0	0	2	5	0	7 (4.7%)
Total	8	7	5	87	33	8	148 (100%)

Figure 30: Occurrence of Shigellosis by Year Reported, Wyoming, 2003-2008

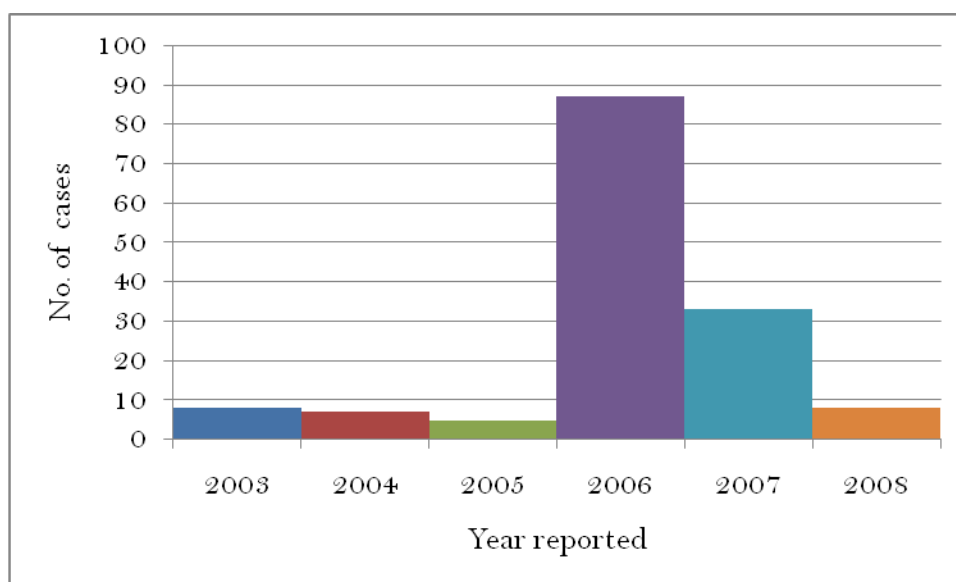


Figure 31: Incidence of Shigellosis by Month Reported, Wyoming, 2003-2008

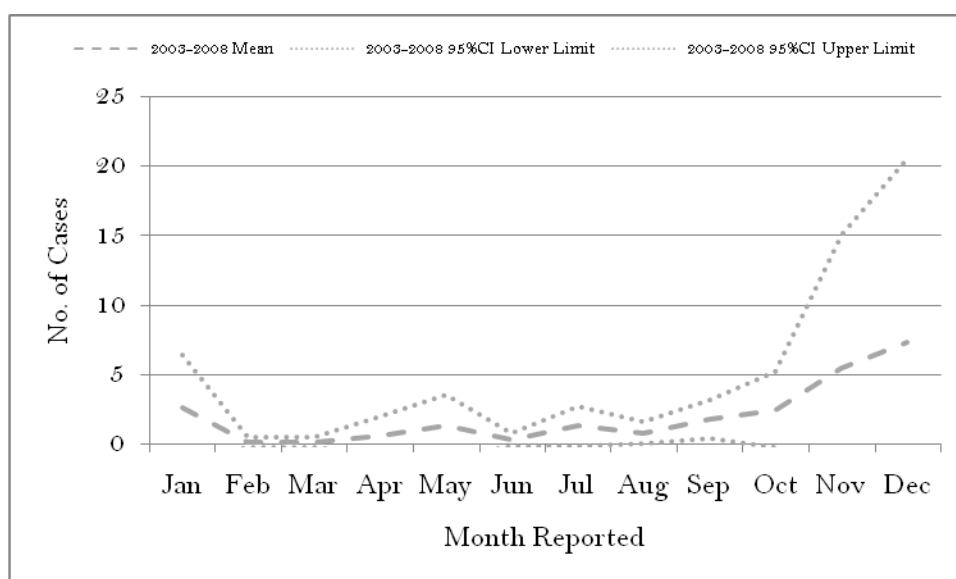
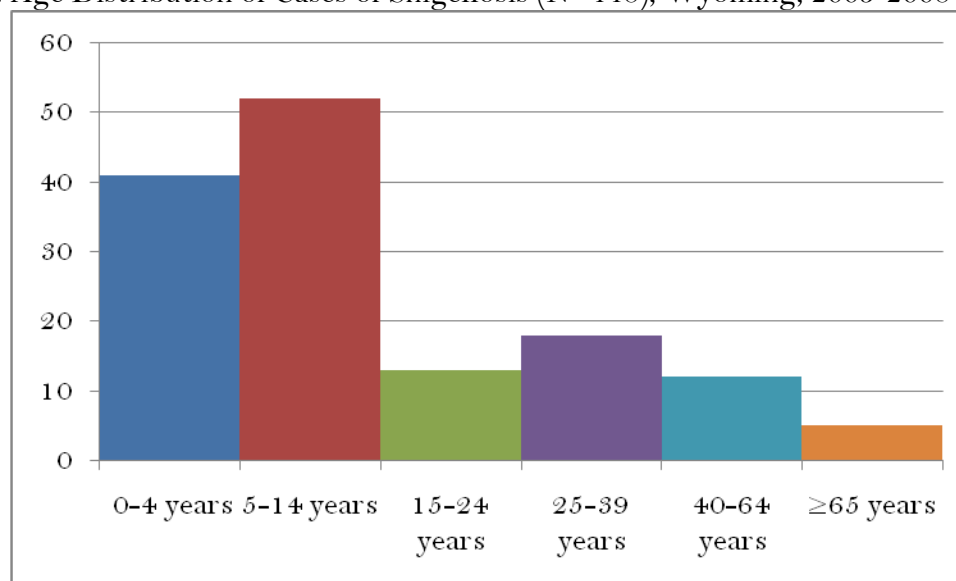


Table 57: Demographics of Case Patients with Shigellosis (N=148), Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total n(%)
Age							
0-4 years	1	1	2	24	12	1	41 (27.7%)
5-14 years	0	1	0	42	8	1	52 (35.1%)
15-24 years	1	1	0	9	1	1	13 (8.8%)
25-39 years	2	0	1	8	6	1	18 (12.6%)
40-64 years	3	2	2	2	2	1	12 (8.1%)
≥65 years	0	2	0	0	0	3	5 (3.4%)
Unknown	1	0	0	2	4	0	7 (4.7%)
Median age	32 yrs	60 yrs	34 yrs	6 yrs	7yrs	42.5yrs	8yrs
Age range:	3-62 yrs	2-89 yrs	4-57yrs	0-53yrs	0-58yrs	3-86yrs	0-89 yrs
Gender							
Female	2	3	4	47	20	5	81 (54.7%)
Male	6	4	1	40	13	3	67 (45.3%)
Hospitalized							
Yes	0	1	3	15	4	2	25 (16.9%)
No	8	5	2	65	21	5	106 (71.6%)
Unknown	0	1	0	7	8	1	17 (11.5%)
Median no. of days hospitalized	—	1 day	1 day	2 days	1 day	2 days	1 day
Range of no. of days hospitalized	—	1 day	1-3 days	1-4 days	1-2 days	1-3 days	1-4 days
Outbreak status							
Outbreak/ cluster related	3	0	0	86	28	0	117 (79.1%)

Figure 32: Age Distribution of Cases of Shigellosis (N=148), Wyoming, 2003-2008



*Seven cases had an unknown age.

Table 58: Crude and Age-adjusted Incidence of Shigellosis by County, Wyoming, 2003-2008

	Total No. of Cases	Crude incidence rate (per 100,000 per year)	Age-adjusted incidence rate (per 100,000 per year)	SIR* (95%CI)
Albany	0	0.00	0.00	—
Big Horn	4	5.98	5.19	1.07 (0.02-2.11)
Campbell	0	0.00	0.00	—
Carbon	2	2.22	2.05	0.42 (-0.16-1.01)
Converse	2	2.67	2.68	0.55 (-0.21-1.32)
Crook	0	0.00	0.00	—
Fremont	118	53.79	51.63	10.62 (8.71-12.54)§
Goshen	0	0.00	0.00	—
Hot Springs	0	0.00	0.00	—
Johnson	0	0.00	0.00	—
Laramie	4	0.78	0.77	0.16 (0.00-0.31)§
Lincoln	0	0.00	0.00	—
Natrona	9	2.18	2.18	0.45 (0.16-0.74) §
Niobrara	0	0.00	0.00	—
Park	0	0.00	0.00	—
Platte	0	0.00	0.00	—
Sheridan	1	0.61	0.71	0.15 (-0.14-0.43)§
Sublette	0	0.00	0.00	—
Sweetwater	5	2.22	2.26	0.46 (0.06-0.87) §
Teton	2	1.72	1.65	0.34 (-0.13-0.81) §
Uinta	0	0.00	0.00	—
Washakie	1	2.15	1.99	0.41 (-0.39-1.21)
Weston	0	0.00	0.00	—
Total	148	4.86	4.80	0.73 (0.61-0.85)†§

*Wyoming state population used as “standard” population when calculating age-adjusted estimates for each county.

† SIR calculated using estimated national incidence rate of 6.59 cases per 100,000 per year.

§ Estimate is statistically different than the expected incidence rate. Estimates of greater than 1.00 indicate incidence is greater than what is expected and estimates less than 1.00 indicate incidence is less than what is expected and that these differences cannot be explained by differences in the age distribution of the population.

Table 59: Clinical Characteristics among Cases of Shigellosis, Wyoming, 2003-2008

	2003	2004	2005	2006	2007	2008	Total, (%)
Had gastrointestinal symptoms							
Yes	6	5	5	66	21	6	109 (73.6%)
No	0	0	0	1	0	1	2 (1.4%)
Unknown	2	2	0	20	12	1	37 (25.0%)
Specimen source							
Stool	8	5	5	85	27	6	136 (96.5%)
Blood	0	0	0	0	0	0	0 (0.0%)
Urine	0	2	0	0	1	1	4 (2.8%)
Other	0	0	0	0	0	1	1 (0.7%)
Unknown							
Bacterial isolate was confirmed at WPHL*							

Yes	3	0	4	78	25	6	116 (78.4%)
No	5	7	1	9	8	2	32 (21.6%)
Species of <i>Shigella</i> (N=130)							
<i>S. sonnei</i>	4	2	4	84	25	6	125 (96.2%)
<i>S. boydii</i>	1	0	0	0	1	0	2 (1.5%)
<i>S. flexneri</i>	0	0	1	0	1	0	2 (1.5%)
<i>S. dysenteriae</i>	0	1	0	0	0	0	1 (0.8%)
Received antibiotic							
Yes	4	2	1	44	17	4	72 (48.7)
No	0	1	0	6	2	2	11 (7.4%)
Unknown	4	4	4	37	14	2	65 (43.9%)

* *Wyoming state statute requires clinical laboratories to send confirmed Salmonella isolates to the Wyoming Public Health Laboratory for confirmation, subtyping and pulsed-field gel electrophoresis analysis.*

Table 60: Most Likely Source of Infection among Cases of Shigellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total, (%)
Person-to-person transmission	0	0	2	79	19	0	100 (67.6%)
No source evident	5	6	0	7	13	7	35 (23.6%)
Foreign travel	3	1	2	0	1	1	8 (5.4%)
Daycare transmission	3	0	1	0	0	0	4 (2.7%)
Occupational/laboratory exposure	0	0	0	1	0	0	1 (0.7%)

Likely exposures are determined by making a "best guess" by trained epidemiologists based on the case patient's exposure history and should not be viewed as a definitive source of infection.

Table 61: Frequency of Other Exposures among Cases of Shigellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Ate at any restaurant	2	3	2	22	12	4	45 (30.4%)
Ate at any fast food restaurant	0	1	0	17	5	2	25 (17.0%)
Consumed water from a private well	2	0	0	3	0	1	6 (4.1%)
Swam in treated water venue	2	0	0	1	0	0	3 (2.0%)
Swam in untreated water venue	0	0	0	2	0	0	2 (1.4%)
Attended daycare	0	0	1	10	2	0	13 (8.8%)
Live with daycare attendee	1	0	1	6	2	0	10 (6.8%)
Out of state travel	4	2	3	3	7	4	23 (15.5%)
International travel	3	1	3	0	1	1	9 (6.1%)

Percentages can add up to more than 100% because case patients can report more than one of these exposures.

Table 62: Frequency of Reported High-Risk Occupations among Cases of Shigellosis, Wyoming, 2003-2008.

	2003	2004	2005	2006	2007	2008	Total
Food-handling employee	0	0	0	0	0	1	1 (0.7%)
Healthcare worker with direct	0	0	0	0	0	0	0 (0.0%)

patient contact							
Daycare worker	1	0	0	1	1	0	2 (2.0%)

Public health guidelines call for the exclusion of these individuals from their high-risk occupational setting until the patient has provided two consecutively negative stool samples that were collected at least 24 hours apart and at least 72 hours after the cessation of antibiotic therapy.

Outbreaks of Shigellosis, 2003-2008

Daycare-Associated Outbreak of Shigellosis, Big Horn County, 2003

In July 2003, information gathered during routine surveillance of a confirmed case of *Shigella sonnei* led to the identification of an outbreak of shigellosis in a daycare/preschool operation in Big Horn County, Wyoming. Seven of 18 staff members and ten of 21 children were reported to have had a diarrheal illness within the two weeks prior to the original report. Of seventeen stool samples collected, three were positive for *Shigella sonnei*. The center closed voluntarily, and the local Public Health Nursing staff conducted handwashing and educational seminars and advised the staff on appropriate cleaning of the facility. After the center reopened no new cases were reported.

Outbreak of Multidrug Resistant Shigella sonnei Associated with the Wind River Indian Reservation and Surrounding NonTribal Communities, Fremont County, 2006-2007

From August 2006 to April 2007, 106 cases of *Shigella sonnei* were reported to the WDH Infectious Disease Epidemiology Program. The median age of case patients was five years (range: 0–56 years), and 77% occurred among children aged ≤ 10 years. Overall, 55% were female. Among the reported cases, 88% were American Indian associated with the Wind River Indian Reservation. The WDH Infectious Disease Epidemiology Program worked cooperatively with tribal and federal agencies to control the outbreak. No point source was identified, and person-to-person transmission was suspected to propagate the outbreak. It was assumed that many cases had multiple points of exposure in their communities. Implemented prevention measures included community-wide public education, school-based hand-washing education, and exclusion of ill persons from working in food establishments, daycare/childcare venues, and healthcare facilities. Ill children were excluded from school while symptomatic. Efforts were made to educate local healthcare providers about bacteriologic antibiotic resistance patterns and appropriate treatment options. Overall, 28% of *Shigella* isolates associated with this outbreak were resistant to ampicillin, 62% were resistant to TMP/SMX, and 38 % were resistant to piperacillin. Pulsed field gel electrophoresis (PFGE) analyses revealed concurrent outbreaks of two strains of multidrug-resistant *Shigella sonnei* on American Indian reservations and surrounding non-tribal communities in North Dakota, South Dakota, and Montana.

Trichinellosis

Case definition

- Confirmed – a clinically compatible case that is laboratory-confirmed using at least one of the following methods:
 - Demonstration of *Trichinella* larvae in tissue obtained by muscle biopsy, or
 - Positive serologic test for *Trichinella*

Summary

From 2003-2008, no cases of trichinellosis were reported to the WDH Infectious Disease Epidemiology Program (0.00 cases per 100,000 per year). The incidence of trichinellosis in Wyoming was statistically equivalent to the estimated US incidence (0.00 cases per 100,000 per year) based on CDC National Notifiable Disease Surveillance System.

Outbreaks of Trichinellosis

The WDH Infectious Disease Epidemiology Program did not investigate any outbreaks of trichinellosis in 2003 through 2008.

Vibrio (cholera and non-cholera species)

Case definition

- *Vibrio cholerae* (Cholera)
 - Confirmed – isolation of toxigenic (cholera toxin-producing) *Vibrio cholerae* O1 or O139 from a clinical specimen
 - Probable – a clinically compatible symptomatic case that is epidemiologically-linked to a confirmed case
- Non cholera *Vibrio* species (Vibriosis)
 - Confirmed - isolate of *Vibrio* species other than toxigenic *Vibrio cholerae* O1 or O139 from a clinical specimen
 - Probable – a clinically compatible symptomatic case that is epidemiologically-linked to a confirmed case

Summary

From 2003-2008, no cases of cholera or non-cholera vibriosis were reported to the WDH Infectious Disease Epidemiology Program (0.00 cases per 100,000 per year). The incidence of cholera in Wyoming was statistically equivalent to the estimated US incidence (0.00 cases per 100,000 per year) (SIR: incalculable), and the incidence of non-cholera vibriosis in Wyoming was also statistically equivalent to the estimated US incidence (0.18 cases per 100,000 per year).

Outbreaks of Cholera or Non-cholera Vibriosis

The WDH Infectious Disease Epidemiology Program did not investigate any outbreaks of cholera (*Vibrio cholerae*) or non-cholera vibriosis (*Vibrio species* other than *V. cholerae*) in 2003 through 2008.

Yersiniosis

Case definition:

- Confirmed – isolation of *Yersinia* species from a clinical specimen
- Probable – a clinically compatible case that is epidemiologically-linked to a confirmed case

This disease is not nationally notifiable, and therefore the case definition is used in Wyoming for surveillance purposes.

Summary

From 2003-2008, no cases of yersiniosis were reported to the WDH Infectious Disease Epidemiology Program (0.00 cases per 100,000 per year). The incidence of yersiniosis in Wyoming was statistically equivalent to the estimated US incidence (1.00 cases per 100,000 per year) (SIR: incalculable).

Outbreaks of Yersiniosis

The WDH Infectious Disease Epidemiology Program did not investigate any outbreaks of yersiniosis in Wyoming from 2003 through 2008.

Summary of Other Enteric Disease Outbreaks Not Summarized Above

Outbreak of Norovirus Gastroenteritis in Yellowstone National Park, 2003

In July 2003, personnel from the WDH Infectious Disease Epidemiology Program assisted the Regional Public Health Consultant to the National Park Service in investigating an outbreak of diarrheal disease in concession employees of Yellowstone National Park. Investigation showed that the illness was associated with one particular employee dining room and was most likely the result of an ill employee working in food service while symptomatic. Approximately 30 employees were affected. Five stool samples were collected. All five samples tested negative for enteric bacterial pathogens. Four of the five tested positive for norovirus. Policies were already in place to prohibit ill employees from working in food service, however, education was provided to concession operators to make a very serious attempt to exclude ill employees from food service preparation and to limit access to employee kitchens to on-duty employees.

Outbreak of Gastrointestinal Illness, Campbell County, 2003

In August 2003, the WDH Infectious Disease Epidemiology Program was notified of several cases of gastrointestinal illness in people who had attended a wedding reception in Campbell County. The event was held at a local banquet facility and was catered by a local restaurant. The wedding cake was made by a local cake-maker in her home. Thirty of 57 guests (53%) met the case definition of gastroenteritis after attending the wedding reception. Based on statistical analysis it appeared that cake, potato salad, lemonade, and watermelon were the 4 food items most strongly associated with illness. Five of six employees of the catering restaurant and the cake-maker were interviewed. All of them denied gastrointestinal illness at the time of the reception or in the preceding month. A stool specimen obtained from one of the cases tested negative for bacterial pathogens and negative for Norovirus. Another case patient was admitted to the local hospital during his illness and a stool culture obtained during that time was negative for bacterial pathogens. Available food samples also tested negative for Norovirus. The clinical and epidemiologic characteristics of this outbreak were suggestive of viral gastroenteritis.

Outbreak of Gastroenteritis Associated with a Hotel, Laramie County, 2004

In late February 2004, the Cheyenne Laramie County Health Department and the WDH Infectious Disease Epidemiology Program began investigating an outbreak of gastrointestinal illness among people who had recently attended functions at a local Cheyenne hotel. Initial case finding and data gathering revealed 124 people with illness that may have been associated with this outbreak. A case-control study was conducted which included 209 people, including 107 cases and 102 controls. Diarrhea was present in 101 (95.3%) and vomiting in 67 (63.8%) of the cases. The median duration of illness was two days. All 15 stool specimens that underwent bacterial culture were negative for bacterial enteric pathogens. Seven stool specimens underwent testing for norovirus, and six were positive. Exposures that were found to be statistically associated with illness were eating at least one meal or snack that was prepared or served by the hotel (OR 7.7, 95% CI 1.7-34.9), and drinking a beverage from the hotel bar (OR 2.4, 95% CI 1.4-4.2). Investigators recommended that the hotel take appropriate prevention measures, including prohibiting employees from working while ill and requiring that food service employees be symptom-free for 48 hours before returning to work. Particular emphasis was placed on hand hygiene. Also, thorough disinfection of surfaces used in food service, public

restrooms, and public areas was recommended. No new cases were identified after these prevention and control measures were implemented.

Outbreak of Gastroenteritis Associated with a Hotel, Natrona County, 2004

In late May 2004, the Casper Natrona County Health Department began investigating a cluster of gastrointestinal disease among persons who had attended a meeting at a local Casper hotel. A total of 15 cases were identified. Reported symptoms included headache, chills, nausea and vomiting lasting from 24 to 36 hours. All of the symptomatic individuals had consumed food from the hotel cafe on the May 17, 2004 or May 18, 2004. A common food was not identified. No stool or food samples were available for testing, however, the symptoms, incubation period, and duration of illness were suggestive of a viral agent.

Outbreak of Gastrointestinal Illness in Yellowstone National Park, 2004

In early July 2004, the WDH Infectious Disease Epidemiology Program and National Park Service investigators initiated a joint epidemiologic and environmental health investigation into an outbreak of gastrointestinal illness in Yellowstone National Park. A total of 137 cases were identified among 83 employees and 54 visitors who resided in 34 states and three foreign countries. The age range of cases was from one to 91 years; 70 (51%) were male. The reported signs and symptoms were consistent with a viral gastroenteritis. One hundred and nine (80%) cases reported diarrhea, and 102 (74%) reported vomiting. Clinical and environmental testing completed by CDC indicated that the likely agent was norovirus. Epidemiologic information did not suggest a single point-source exposure, but rather multiple events of person-to-person transmission. In addition, the investigation implicated a possible role of buses traveling through the park with ill persons.

Restaurant-Associated Outbreak of Gastroenteritis, Goshen County, 2004

In mid-December 2004, the WDH Infectious Disease Epidemiology Program was notified of a cluster of gastrointestinal illness associated with a restaurant in Goshen County. WDH personnel conducted a retrospective cohort study of the patrons. Of the 87 individuals interviewed, 39 reported gastrointestinal symptoms after eating at the restaurant. Incubation periods ranged from five hours to four days (mean 31 hours). The most common signs and symptoms included nausea, diarrhea, stomach cramps, and vomiting, lasting from six hours to three days. Two stool specimens were collected from ill guests and both tested positive for norovirus. Interviews of restaurant staff members revealed that at least three employees worked while symptomatic. The investigation and subsequent analysis of data did not implicate any one particular exposure as being responsible for the outbreak. It is suspected that multiple means of transmission may have played a role, including person-to-person spread, environmental contamination, or food/water contamination. The presence of recently ill and symptomatic food service workers likely contributed to the outbreak. A consumer health specialist with the Wyoming Department of Agriculture discussed disinfection recommendations and proper hand hygiene practices with the owner and emphasized that ill staff members should not be allowed to work while ill and for the three days following recovery. In addition, the consumer health specialist conducted a food safety class at the restaurant which all employees were required to attend. No additional cases were reported following the implementation of these prevention measures.

Clusters of Viral Meningitis Caused by Enterovirus Infections, Sweetwater and Uinta Counties, 2005

In June and July 2005, the WDH Infectious Disease Epidemiology Program investigated two clusters of viral meningitis in the southwest corner of the state. The first cluster involved a church group from Sweetwater County that traveled to Mexico in mid-June. Seventeen of the 21 persons in the group became ill with various clinical manifestations, including two teenagers who were hospitalized for viral meningitis. One of these persons tested positive for enterovirus. The second cluster involved five cases (two of which tested positive for enterovirus) from Uinta County. No common exposure source was identified among these five cases and no link to the Sweetwater County cluster was identified.

Cluster of Viral Meningitis Caused by Enterovirus Infections Associated with High School Football Teams, Uinta County 2005

Five cases of viral meningitis among players of two Uinta County high school football teams were reported in August and September 2005. Enterovirus was confirmed in one viral meningitis case patient and was the suspected etiology for the other cases. The WDH Infectious Disease Epidemiology Program initiated an investigation among the high school football teams to conduct active surveillance of enterovirus-like illness and to determine possible risk factors or exposures for illness. A self-administered survey was sent to each school nurse to distribute to the football teams. The investigation revealed that 15 high school football players experienced an enterovirus-like illness between July and September. Severe headache, stiff neck, and nausea were the most predominant symptoms reported. Sharing water bottles was suspected to be the most prominent risk factor for illness. The Uinta County Public Health Nursing Office advised school nurses and football coaches to discontinue this practice. The number of viral meningitis cases diminished after sharing water bottles was discontinued. Active case finding also revealed an additional case of viral meningitis in a Uinta County high school student who was not a member of the football team.

Outbreak of Gastroenteritis Associated with a Funeral, Natrona County, 2005

In November 2005, the Casper Natrona County Health Department received a call from a local church regarding a suspected foodborne illness outbreak associated with a funeral reception. Approximately 23 people attended the event. Incubation periods and symptoms described were consistent with viral gastroenteritis. One of the attendees was admitted to Wyoming Medical Center and tested negative for bacterial pathogens. No other attendees were tested. The event had been catered by a church member who was unlicensed and prepared the food in her apartment. Food served included cole slaw, potato salad, macaroni salad, dinner roles, raw vegetables, meat balls and chicken. The caterer was ill several days prior to the event with diarrhea and related symptoms. She was informed that her activities required licensing with the Wyoming Department of Agriculture.

Cluster of Gastrointestinal Illness, Hot Springs and Park Counties, 2005

In December 2005, the WDH Infectious Disease Epidemiology Program received a call from a concerned citizen regarding a group of 12 individuals from Park County who traveled together to an eighth grade boys' basketball tournament in Hot Springs County. The group of 12 attended the basketball games at the middle school, dined at a Mexican establishment for lunch, and then patronized a local hot springs park. Within 24-48 hours after their trip to Thermopolis, ten out of 12 individuals in this group reported gastrointestinal illness mostly comprised of vomiting, abdominal cramping, fatigue, and headache. A few cases also had mild

diarrhea. Of the ten individuals who got sick, all swam in the hot springs pool. All 12 persons in the group ate at the restaurant. An eleventh case of gastroenteritis was reported later that week, and was suspected to be a secondary case. Stool samples were collected from two cases. Both were negative for pathogenic bacteria and parasites. Infection with norovirus genotype I was laboratory confirmed by the Wyoming Public Health Laboratory. WDH initiated active case finding, but did not identify additional cases. WDH was not able to confirm if the restaurant or hot springs were risk factors for illness.

Cluster of Gastrointestinal Illness Possibly Associated with a Restaurant, Park County, 2005

The WDH Infectious Disease Epidemiology Program received a complaint of gastrointestinal illness in a group of three women who dined at a local Powell restaurant in December 2005. All three women experienced nausea, vomiting, headache, and fatigue 6 to 12 hours after dining at the restaurant. They had no other common exposures. None sought medical care and no samples were available for testing. The duration of illness was approximately 24 to 72 hours. No other family members were ill. No additional cases were identified.

Outbreak of Norovirus Gastroenteritis Associated with Local Senior Center, Teton County, 2006

In September 2006, Teton County Public Health Nursing was notified of a cluster of gastrointestinal illness associated with a local senior center. Teton County Environmental Health conducted an outbreak investigation. A total of 30 people became ill after eating a meal at the senior center at noon on September 16, 2006. The investigation did not reveal a common source for the outbreak. Twelve case patients tested positive for norovirus genogroup II at WPHL.

Outbreak of Norovirus Gastroenteritis Associated with Group Meeting and Banquet, Converse County, 2006

In December 2006, the WDH Infectious Disease Epidemiology Program was notified of an outbreak of gastroenteritis associated with a law enforcement meeting and banquet in Douglas, Wyoming. Participants attended trainings at the Wyoming Law Enforcement Academy and ate at banquets provided by a local restaurant. A total of 19 persons developed symptoms of nausea, vomiting and diarrhea after attending these functions. One case patient tested positive for norovirus genogroup II at the WPHL. The epidemiologic investigation revealed that both direct and indirect (through food, beverage, or environmental surfaces) person-to-person transmission propagated the infection. The WDH Infectious Disease Epidemiology Program identified one patron and one beverage-handling employee who were ill prior to the commencement of the meeting. Investigators did not find additional cases associated with the Wyoming Law Enforcement Academy or the local restaurant.

Outbreak of Clostridium perfringens Associated with Elementary School Literacy Event, Laramie County, 2007

In February 2007, the Cheyenne Laramie County Health Department and the WDH Infectious Disease Epidemiology Program were notified of several cases of gastrointestinal illness among people who had attended a literacy event at an elementary school in Cheyenne. Food provided at the event had been prepared by a culinary class from a local high school. The culinary class had not been licensed to sell food to the public. Upon investigation, a total of 27 people met the case definition and ranged in age from five to 60 years. Stool specimens were obtained from 4 symptomatic individuals. Three of the four samples submitted tested positive for the presence

of toxin produced from the sporulation of *Clostridium perfringens* Type A. Statistical analysis of the retrospective cohort study data revealed that individuals who had consumed a sloppy joe mixture at the event had a statistically significant risk of becoming ill.

Waterborne Outbreak of Viral Gastroenteritis Associated with a Snowmobile Lodge, Albany County, 2007

In February 2007, the WDH Infectious Disease Epidemiology Program was notified by the City of Laramie's Consumer Health Specialist of reports of illness among two patrons a snowmobile lodge in western Albany County. Additional groups contacted the WDH Infectious Disease Epidemiology Program to make complaints of illness after visiting and eating at the lodge. A water sample taken from the lodge tested positive for total and fecal coliforms, resulting in a Boil Water Order. The Wyoming Department of Health, Wyoming Department of Agriculture, and the Wyoming Department of Environmental Quality along with the US Environmental Protection Agency investigated the outbreak. Results of the investigation revealed that consumption of the lodge's well water was associated with illness. A total of 39 individuals met the case definition for gastroenteritis. The WDH Infectious Disease Epidemiology Program was unable to get laboratory specimens from case patients to confirm the etiology, but norovirus was suspected based on the clinical presentation of ill persons. The definitive source of well contamination was not identified; however, a sewage backup was suspected to play a role. The Boil Water Order was not lifted until the lodge's water system was in compliance with state and federal drinking water regulations.

Suspected Gastrointestinal and Rash Illnesses Associated with Employees of Two Snowmobile Lodges, Big Horn County, 2007

In April 2007, the WDH Infectious Disease Epidemiology Program was contacted by Big Horn County Public Health regarding a suspected cluster of gastrointestinal and rash illnesses among employees of two snowmobile lodges in the Big Horn Mountains. Additionally, staff members reported sewage and mold problems at both lodges. The WDH Infectious Disease Epidemiology Program worked cooperatively with the National Forest Service, the Wyoming Department of Agriculture, the Wyoming Department of Environmental Quality and the US Environmental Protection Agency to investigate the complaints. The employee health investigation revealed that 70% of employees reported gastrointestinal illness from January through April and 40% reported cold/allergy symptoms, including fever, nasal congestion, fatigue, headache, and rash during the same time period. Employees lived on the lodges' premises and attributed their cold/allergy symptoms to black mold growth in their living quarters. The WDH Infectious Disease Epidemiology Program was not able to attribute staff illnesses to the sewage or mold problems. However, investigators identified substantial hygienic problems at both lodges. Wastewater at both lodges was being unlawfully discharged into waters of the State, and wastewater at one lodge threatened contamination of the well system. Neither lodge had appropriate solid waste removal. Water samples at both lodges did not indicate contamination at the date of visit. However, investigators could not rule out the possibility of previous or future contamination of the well system by wastewater. The National Forest Service had closed both lodges to visitors during the investigation. The Wyoming Department of Health recommended that the lodges and their restaurants not be reopened to the public until the wastewater problem had been resolved and both systems were in compliance with the Wyoming Department of Environmental Quality's regulations, the

restaurants were in compliance with the Wyoming Department of Agriculture's Food Safety Rule, and the cabins at both lodges had been evaluated by a professional mold remediator.

Outbreak of Gastrointestinal Illness Associated with Girls Residential Treatment Facility, Park County, 2007

In April 2007, the WDH Infectious Disease Epidemiology Program was notified by Park County Public Health Nursing of a cluster of gastrointestinal illness among adolescent residents of a girls' residential treatment facility in Park County. Ten of 14 residents reported gastrointestinal symptoms of nausea, vomiting, and diarrhea. Two staff members also reported illness. Stool samples were obtained from 10 (71.4%) of the residents at the facility. No pathogens were identified in the residents' stool samples (i.e. negative for bacterial pathogens and noroviruses). The etiology of the illness was not identified, but investigators suspected that it was caused by *Campylobacter* species. A pig from the facility tested positive for *Campylobacter coli*. Epidemiologic information suggested that the illness was likely associated with contact with farm animals and consumption of water from an outdoor hose (near animals). The investigators did not find any association between the outbreak at the boys' facility and the girls' facility. Both are independently operated, and no staff members reported working concurrently at both facilities.

Possible Ciguatera Toxin Poisoning from Fish Consumption; Natrona County, 2007

In November 2007, the Casper Natrona County Health Department received a complaint from a New Jersey resident regarding possible food poisoning from eating grouper at a Casper restaurant. The case patient had been eating grouper from the Casper restaurant for approximately 25 minutes when she had a syncopal episode and was transferred via ambulance to the emergency department at Wyoming Medical Center. The case patient's symptoms included nausea, musculoskeletal weakness in the legs, eye rolling, dizziness, vomiting, hypotension, and pallor. The attending emergency room physician ruled out a cardiac cause of her symptoms. The physician suggested that ciguatera-toxin poisoning was a possible etiology of the case patient's symptoms. Ciguatera-toxin is a biological toxin known to produce neurological symptoms in humans. Symptoms of ciguatera-toxin poisoning typically occur within 24 hours of fish consumption. The toxin is caused by the presence of dinoflagellate algae in underwater reefs. Fish eating the algae become toxic, and the toxin bioaccumulates as larger predatory fish consume smaller toxic fish. The presence of the toxin does not indicate improper food-handling. The Casper restaurant had purchased the grouper from a large commercial distribution center out of Denver. Currently, food testing is the only available method to confirm poisoning from the ciguatera-toxin; there are no laboratory methods for human testing. The WDH Infectious Disease Epidemiology Program and the Casper Natrona County Health Department conducted active surveillance for other potential cases, but no other cases were identified. Investigators could neither deny nor confirm that the case patient's illness was caused by the ciguatera-toxin.

Outbreak of Norovirus Associated with Conference Center, Albany County, 2008

In April 2008, the WDH Infectious Disease Epidemiology Program was notified of reports of gastrointestinal illness associated with a conference held at a conference center/hotel in Albany County. A group of 117 persons attended various days of the conference, and 15 were reported to be ill. An outbreak investigation was initiated that day by the WDH Infectious Disease Epidemiology Program and City of Laramie officials. Active surveillance revealed similar

gastrointestinal illness in another separate group holding a banquet at the facility on a subsequent day. A total of six people were reportedly ill from that group. Illness was characterized by diarrhea, nausea, vomiting, and stomach cramping. Median duration of illness was 48 hours and is consistent with norovirus. Two stool specimens taken from ill patrons confirmed norovirus genogroup II as the etiology of the illness. The investigation identified several food items served at breakfast, lunch, and dinner buffets to be associated with illness. Employee interviews revealed at least 3 food-handling employees with gastrointestinal illness prior to and during the first group's banquets. One patron also reported illness prior to attending the conference. Norovirus was most likely spread through environmental contamination by ill employees and possibly ill patrons. No additional illnesses were identified in groups holding events at the conference center after April 12, 2008.

Outbreak of Gastrointestinal Illness among Participants of Rotary Conference, Park County, 2008

In June 2008, the WDH Infectious Disease Epidemiology Program was notified of 50-60 reported illnesses after a Rotary conference held in Cody, Wyoming. Three local caterers provided foods and beverages for various events associated with the conference. An outbreak investigation was initiated by the WDH Infectious Disease Epidemiology Program and the Wyoming Department of Agriculture Consumer Health Services Division. The investigation identified 41 persons who met the case definition for gastroenteritis (diarrhea of 3 or more loose stools in 24 hour period lasting at least 6 hours in duration). The etiology of the outbreak was not confirmed through laboratory methods. Illness was characterized by diarrhea with no vomiting or fever. Median incubation period was 12.5 hours, and median duration of illness was 37 hours. Epidemiologic data suggested that several foods served at a BBQ dinner provided by one local caterer were associated with illness. The illness was suspected of being a toxin-mediated illness based on illness characteristics. Foods and beverages served at the conference were prepared off-site and were transported to the conference venue. Investigators suspect that temperature abuse of foods by the one caterer was responsible for the toxin-mediated illness. Environmental health investigations identified problems with temperature control upon kitchen inspection of the one caterer that prepared food for the Friday night BBQ. Prevention measures were implemented with the caterer associated with participants' illnesses.

Possible Cluster of Gastrointestinal Illness Associated with a Detention Center, Campbell County, 2008

In June 2008, the WDH Infectious Disease Epidemiology Program received a report from a detention center in Campbell County stating that 20-30 inmates had experienced a gastrointestinal illness. Follow-up with facility confirmed that as many as 30 inmates were reporting illness, but no symptoms were physically observed by detention center medical staff. The medical supervisor suspected that some illnesses were real and some may have been feigned. The medical supervisor also suspected that the illness was foodborne in nature, and kitchen staff report some potential breaks in food safety. A consumer health specialist followed-up with the facility by conducting a full kitchen inspection. Some violations in the Wyoming Food Safety Rule were noted and were corrected.

Outbreak of Norovirus Genogroup II at Guest Ranch, Teton County, 2008

In August 2008, the WDH Infectious Disease Epidemiology Program was notified by Teton County Public Health of a cluster of norovirus-like illnesses at a guest ranch in rural Teton County. Investigation revealed that a housekeeping staff member had brought her ill son to

work the previous week. The ill child, one ill employee, and two ill guests were confirmed with norovirus genogroup II infection at WPHL. Water tests did not suggest a problem with the ranch's drinking water system. Investigators suspected that person-to-person transmission was responsible for the spread of the infection from staff members to guests. All staff members assisted with food preparation and/or food service, and staff members attended the same meals with the guests. Teton County Public Health provided the ranch with guidance on disinfection and food safety.

Outbreak of Norovirus Genogroup II Among Travelers of a National Park Bus Tour, Teton County, 2008

In October 2008, the WDH Infectious Disease Epidemiology Program was notified by National Park Service officials of a group of 12 travelers from the same bus tour presenting to the Old Faithful Clinic with symptoms of viral gastroenteritis. The bus tour had commenced in Kalispell, Montana and was on its way to Jackson, Wyoming that day. Public health officials were able to collect stool specimens on two ill travelers. Both travelers were positive for norovirus genogroup II at the Wyoming Public Health Laboratory. Teton County Public Health provided education to travelers and to the hotel in Jackson set to receive them to help prevent further transmission. A point source was not identified. The National Park Service disease surveillance system did not identify any other concurrent outbreaks among park staff or guests.

Outbreak of Gastroenteritis Among Holiday Party Attendees, Natrona County, 2008

In December 2008, the WDH Infectious Disease Epidemiology Program was notified of a suspected cluster of illness among coworkers and their guests who attended a catered holiday party at a local Natrona County restaurant. Sixteen individuals reported mild gastrointestinal illness. The median incubation period was 13 hours and the median duration of illness was 37 hours. Attempts were made to acquire laboratory specimens for testing, but no ill patrons provided stool samples. Crude epidemiologic analyses suggested that a prime rib roast may have been associated with illness. The Casper Natrona County Health Department assessed food preparation practices and advised the restaurant on proper food-handling. No additional illnesses related to the venue were identified.

Outbreak of Norovirus Among Coworkers, Natrona County, 2008

The WDH Infectious Disease Epidemiology Program was notified in December 2008 of a cluster of gastrointestinal illness among coworkers who had consumed a breakfast meal from Restaurant A and a lunch meal from Restaurant B. The WDH Infectious Disease Epidemiology Program and the Casper Natrona County Health Department cooperatively investigated the cluster. A total of 10 individuals who attended the Business A's holiday party were ill with gastroenteritis after eating the breakfast served by Restaurant A, and/or lunch served by Restaurant B. Norovirus genogroup II was identified in the stool of two case patients at WPHL. Statistical analyses revealed no food items or other exposures were associated with illness. One employee of Business A reported illness onset before the office party, and that employee's symptoms were consistent with norovirus infection. The timing of illness onset and illness duration do not suggest a point source exposure consistent with consumption of breakfast or lunch at Business A. No employees or additional patrons of the Restaurant B reported being ill. Given the analysis above and the contagiousness of norovirus, the most likely source of illness was the presence of recently ill persons (visitors and/or other

employees) within the Business A setting. Norovirus is highly contagious, can be easily spread from person to person and can be shed up to 48 hours after a person's last episode of vomiting or diarrhea. The investigators believe the gastrointestinal illnesses at Business A did not originate from consumption of food from Restaurant A or B. Norovirus education materials were provided for the business and restaurants involved in this outbreak.

Below is a summary of enteric disease outbreaks occurring in Wyoming in 2003 through 2008, including outbreaks caused by consumption of contaminated food or water or by direct or indirect contact with infected animals. Outbreaks excluded from this summary include outbreaks in which the investigation did not take place in Wyoming (i.e., multistate outbreak involving Wyoming citizens that was investigated by another state health department or by the US CDC). Outbreaks of viral gastroenteritis in long term care facilities in which the source of the outbreak was person-to-person transmissions through poor infection control practices are also not included in this summary, but are included below in a separate summary. Therefore, this summary includes those disease outbreaks in which the investigation was initiated by a Wyoming-based health department, either the Wyoming Department of Health or one of the county health departments.

Table 63: Listing of Enteric Disease Outbreaks, Wyoming, 2003-2008

Year	County	Etiology	Subtype	Confirmed	Probable	Secondary	Total ill	First onset	Hosp	Venue	Vehicle	Source
2003	Big Horn	Shigella	sonnei	3	14	0	17			daycare	unknown	person to person
2003	Park	Salmonella	Heidelberg	39	26	0	65	4/26/2003	14	restaurant	Swiss cheese, mushrooms	unknown
2004	Natrona	Salmonella	unknown	2	0	0	2			private home	turtle feces	reptile
2004	Lincoln	E. coli	O26:H11, O103:H2	6	0	0	6			unknown	unknown	unknown
2004	Uinta	Campylobacter	jejuni	1	2	0	3			private home	bovine feces	bovine
2004	Sheridan	Campylobacter	coli	2	0	0	2			pheasant farm	pheasant feces	avian
2004	Laramie	Norovirus	undetermined	3	121	0	124	2/20/2004	0	banquet facility	unknown	ill foodhandler
2004	Natrona	Unknown		0	16	0	16	5/18/2004	0	restaurant	unknown	unknown
2004	Park	Campylobacter	undetermined	5	1	0	6	7/1/2004	1	dairy	unpasteurized milk	unpasteurized milk
2004	Goshen	Norovirus	undetermined	2	34	0	36	12/9/2004	1	restaurant	unknown	ill foodhandler
2005	Teton	Unknown		0	16	0	16	1/25/2005	2	restaurant	unknown	unknown
2005	Park	Campylobacter	jejuni	2	1	0	3	3/4/2005	0	dairy	unpasteurized milk	unpasteurized milk

2005	Sweetwater	Salmonella	Enteritidis	9	11	0	20	6/20/2005	4	restaurant	eggs, tomato	unknown
2005	Converse	Campylobacter	jejuni	2	4	0	6	7/4/2005	0	swimming pool	untreated recreational water	untreated recreational water
2005	Uinta	Campylobacter	jejuni	2	9	0	11	7/8/2005	2	private home	unpasteurized milk	unpasteurized milk
2006	Campbell and Crook	Cryptosporidium	parvum	34	0	5	39	6/2/2006	0	multiple	recreational water	treated and untreated recreational water
2006	Sweetwater	Salmonella	Enteritidis	1	5	0	6	6/10/2006	0	foreign travel	unknown	unknown
2006	Platte	Multiple	campy and norovirus (both)	17	95	27	139	6/28/2006	0	summer camp	untreated drinking water	untreated drinking water
2006	Fremont	Shigella	sonnei	97	5	0	102	8/10/2006	19	multiple	unknown	unknown
2006	YNP	Norovirus	genogroup II	2	98	0	100	8/31/2006	0	bus tours	unknown	unknown
2006	Teton	Norovirus	genogroup II	12	18	0	30	9/16/2006	0	caterer	unknown	unknown
2006	Converse	Norovirus	genogroup II	1	17	0	18	12/6/2006	0	banquet facility	coleslaw, mixed fruit, cheesecake, alcohol	ill foodhandler
2006	Campbell	Norovirus	genogroup II	1	49	0	50	12/31/2006	1	banquet facility	unknown	unknown
2007	Crook	Cryptosporidium	parvum	2	10	0	12		0	swimming pool	treated recreational water	treated recreational water
2007	Park	Campylobacter	jejuni	2	10	0	12		0	youth residential facility	zoonotic	bovine
2007	Albany	Unknown		0	39	0	39	1/7/2007	0	restaurant	untreated drinking water	untreated drinking water
2007	Big Horn	Unknown		0	10	0	10	2/15/2007	0	lodge	unknown	unknown

2007	Laramie	Clostridium	perfringens	2	24	0	26	2/16/2007	1	school	ground beef	ground beef
2007	Lincoln	Salmonella	Muenster	14	0	0	14	3/27/2007	2	restaurant	unknown	unknown
2007	Park	Unknown		0	12	0	12	4/13/2007	0	youth residential facility	unknown	unknown
2007	Uinta	Salmonella	Typhimurium	3	1	0	4	9/25/2007	0	private home	unknown	unknown
2007	Goshen	E. coli	O157:H7	3	1	0	4	11/12/2007	0	private home	unknown	unknown
2007	Sheridan	Salmonella	Typhimurium	3	1	0	4	12/9/2007	0	restaurant	unknown	unknown
2008	Natrona	Hepatitis A		2	0	0	2			foreign travel	unknown	unknown
2008	Goshen	Campylobacter	jejuni	2	3	0	5			private home	unknown	unknown
2008	Uinta	Entamoeba	histolytica	3	1	0	4		2	private home	unknown	unknown
2008	Natrona	Unknown		0	16	0	16		0	restaurant	roast beef	temp abused food
2008	Campbell	Salmonella	Litchfield	4	0	0	4	2/13/2008	0	restaurant	unknown	unknown
2008	Albany	Norovirus	genogroup II	2	21	0	23	4/11/2008	1	banquet facility	Fruit	unknown
2008	Park	Unknown		0	41	0	41	6/6/2008	0	caterer	potato salad and bread pudding	temp abused food
2008	Teton	Norovirus	genogroup II	4	27	0	31	7/30/2008	0	guest ranch	unknown	person to person
2008	Teton	Giardia	lamblia	2	6	0	8	11/2/2008	0	foreign travel	unknown	unknown
2008	Natrona	Norovirus	genogroup II	2	8	0	10	12/23/2008	0	restaurant	unknown	person to person

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